TUBERCULOSIS

ITS CAUSE CURE AND PREVENTION

EDWARD O. OTIS, M.D.

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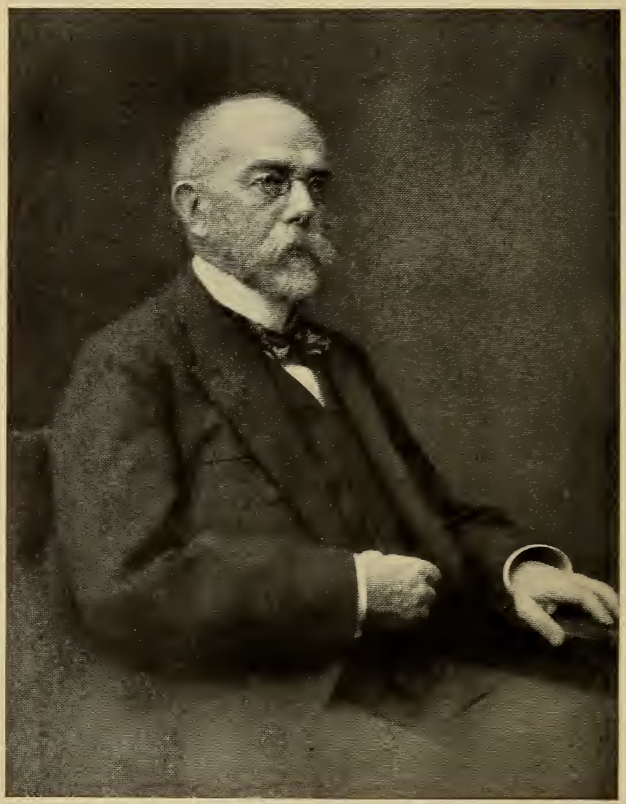

R. Koch.

Discoverer of the Tubercle Bacillus.

TUBERCULOSIS:

ITS CAUSE, CURE AND PREVENTION

A REVISED EDITION OF

"THE GREAT WHITE PLAGUE"

(*A BOOK FOR LAYMEN*)

BY

EDWARD O. OTIS, M.D.

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TO GEORGE ADAMS LELAND, M. D.

A friend of years, through whose kindly interest this book was written.

"The Modern Crusade against tuberculosis brings hope and bright prospects of recovery to hundreds and thousands of victims of the disease who under old teachings were abandoned to despair."

THEODORE ROOSEVELT.

PREFACE

In the following pages an attempt has been made to present the simple facts of tuberculosis in such a form as will be intelligible and interesting to the layman. A decade or more ago, no one would have entertained the idea of publishing a popular book upon this subject; but since that time the great Crusade against tuberculosis has become so universal and prominent, that to-day the subject excites the deepest interest in almost every community, and the people are everywhere eager to learn the essential facts with regard to its cause and cure.

Many things have been repeated advisedly, as the subject has been viewed from different standpoints. Naturally there still remain unsettled problems upon tuberculosis; but the narrative has been presented in the light of the present knowledge of the subject, and with an absolute adherence to definitely established facts. Thanks to the unceasing efforts of investigators in many lands, we now possess sufficient knowledge of so final and

definite a character as to render it possible to wage this momentous campaign with an assured hope of success in the prevention and ultimate eradication of the "Great White Plague." Wonderful strides have been made, in the last few years, in both discovering the secrets of this world-wide disease, and also in educating the general public upon the subject. The future prospect is most hopeful; and the rapidity with which the end can be achieved will depend upon the efforts of every individual, and the material aid which both people and governments will contribute towards it.

E. O. O.

BOSTON, *July* 1, 1909.

PREFACE TO REVISED EDITION

SINCE this book was published under the title of "The Great White Plague," four and a half years ago, no startling discovery has been made either regarding the nature or the cure of tuberculosis; nor have the methods of fighting the disease been materially changed. The open-air treatment still maintains its supremacy, and experience has demonstrated the value of the preventive measures then in use. Only, the fight has become more universal, more determined, and more intense, with larger forces and material resources. In this revision the form and substance of the book have been retained and only such changes and additions have been made as new data and increased experience and knowledge have rendered necessary to bring it up to date.

Tuberculosis still prevails to an enormous extent, but it is steadily decreasing, with no reason to suppose that it will not continue to do so, though with perhaps lessened rapidity. The past success brings courage and hope, and "so long as we are fighting with hope," says Sir William Osler, "the victory is in sight."

E. O. O.

BOSTON, *January* 1, 1914.

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I. TUBERCULOSIS—ITS PREVALENCE AND ITS SIGNIFICANCE

TUBERCULOSIS or consumption has been aptly called the "Great White Plague." We might also call it the "Silent White Plague," for although it is a veritable plague in its universal and great prevalence, as we shall see directly, yet it so slowly and silently seizes upon its victims, and the world has grown so accustomed to it, that it possesses little of that dramatic incident attendant upon its ravages that the plague of old had in its sudden and appalling visitation upon a community, when, as Daniel Defoe said in his famous description of the plague in London in 1665, "Men everywhere began to despair; every heart failed them for fear; people were made desperate through the anguish of their souls, and the terror of death sat in the countenances of the people."

The plague of old, however, with its almost incredible mortality, decimating the inhabitants of a country in a short time, accomplished its fatal work and was done. The present white plague, tuberculosis, is never done with its insidious work; for numberless years it has been silently, continuously and unrelentingly pursuing its destructive course, never remitting its deadly work, always reaching out for new victims, and to-day it is the most universal scourge of the human race. It is hardly conceivable that in any modern country or city of the world any such ravages of the plague of old should again occur, such, for example, as happened in Marseilles in 1720, when 80,000 people were destroyed by it in a short time, and in London in 1665, when 70,000 inhabitants perished, while Italy was said to have lost half its inhabitants from it, and over one million died in Germany.

Neither do we attribute to inscrutable providence or to nature the "desolation of great pestilences" as did, in their ignorance, the pious men of old. Science has revealed to us that it was not omnipotence or nature which afflicted mankind with pestilential dis-

eases, but man himself through his own ignorance and uncleanliness. On the contrary rather, we can with greater justice affirm that it was the hand of a beneficent providence which revealed to man the causes of these epidemic diseases and their prevention, and which brought to mankind through the great scientist, Louis Pasteur, those wonderful words of hope so often quoted: "It is in the power of man to cause all parasitic (germ) diseases to disappear from the world."

We now know that the plague was an infectious or germ disease like all the other great epidemic diseases; and it was caused by a germ known as the "bacillus pestis." We also know that the "favorable soil," as we call it, for its ravages, was the uncleanliness of the mediæval cities, which abounded in filth and possessed no sanitation in the modern sense of the word. When once cleanliness and improved sanitation, such as now exist in all modern cities, came into existence, the conditions for the spread of the plague were lacking, and it has now practically disappeared from modern civilized centers.

Great Epidemics of the Middle Ages

Such is also the case with other of the great epidemics of the middle ages,—one after another they have been for the most part eliminated by modern methods of prevention and sanitation, such as Asiatic cholera, yellow fever, typhus fever, epidemic dysentery and others. Small-pox was a genuine scourge to mankind until the immortal Jenner discovered vaccination in 1796, and now it only occurs in cases where vaccination has been neglected. Leprosy, which is also an infectious disease caused by a germ or bacillus very similar to the bacillus of tuberculosis, existed all over Europe in the middle ages. In the reign of Louis VIII. of France there were 2,000 leper houses or asylums in that country alone, while in Great Britain such houses were dotted all over the land. At the present time, as we know, a case of this disease is a rare occurrence among us. Better knowledge of the causes of these diseases, cleanliness, better sanitation and individual hygiene have conquered them, and in consequence the horrors of great epidemics have vanished, and one's expectancy of life is increased from an aver-

age of less than fifteen years in 1643 to more than forty years at the present time, and the average annual death rate throughout the civilized world has been reduced from fifty or more per each 1,000 of the population in the seventeenth and eighteenth centuries to less than half that number at the present time.

If we could only eliminate all infectious or contagious diseases, what an immeasurable boon would be conferred upon mankind, and upon generations yet unborn! What has been accomplished with the single contagious disease, diphtheria, by antitoxin, which has reduced its mortality from about 40 per cent. to 12 per cent., and even much less if used early enough, we may confidently hope will be accomplished in time with other similar contagious diseases. Towards this goal a thousand investigators are working in the laboratories of research and in the hospital clinics.

Universality of Tuberculosis

Tuberculosis still remains, however, as the most destructive and universal disease which afflicts mankind. "In all climates," says Dr. Ransome, "in the North, and in the South,

East and West, however various the conditions under which men live, however much they may differ in race, in diet, and clothing, and in habits of life, wherever human beings are congregated together there tuberculosis is to be found." Although tuberculosis exists among all classes of society, in the homes of the rich and in the tenements of the poor, yet it is far more prevalent among the "poor and starving," for misery and poverty are powerful predisposing causes. It has, therefore, been well called a "social evil," a "disease of the masses," for so often is the tuberculosis individual a victim of social conditions which it is impossible for him to overcome; the workman cannot change the bad air of his workshop, or live in a model tenement, or always obtain sufficient and nutritious food. In Budapest, for example, Dr. Korösi found that consumption caused 22 per cent. of all deaths among the poor, but only 16 per cent. among the well-to-do. The Germans call tuberculosis the disease of the common people, "Volkskrankheit."

"Every other resident adult you meet in the streets," wrote Dr. Oliver Wendell Holmes

in 1867, "is or will be more or less tuberculous." And a German authority has recently declared that one-half of all deaths and one-half of the sickness among adults in Germany can be charged to tuberculosis. In that country—Germany—the present yearly mortality from this disease is about 100,000. In France the yearly mortality is 88,000, and in the city of Paris it is about 9,600, which is nearly one-fifth of the whole number of deaths, and three times as many deaths as from all the other contagious diseases together. In Great Britain and Ireland the annual sacrifice is 75,000, and in the city of London about 9,600. In 1904 in England tuberculous diseases caused sixty deaths to sixty-seven caused by the combined chief acute infectious diseases, namely:—measles, whooping cough, diarrhœa and dysentery, typhoid fever, diphtheria, scarlet fever, small pox and typhus fever. In Austria the yearly mortality is over 80,000; and in the city of Vienna over 5,000; in Italy 50,000 to 60,000; and in the United States 150,000 or more, or one death about every three minutes. In the State of Pennsylvania it is 8,000 and in New York State over 14,000 or ten per cent. of all deaths. In

Greater New York City it is 8,500 and in Chicago 3,600. Massachusetts has a sacrifice of 4,400 and its metropolis, Boston, 1,050. In New Orleans it is about 900 annually. As great as this mortality is it is far less than it was fifteen or twenty years ago as we shall later see. One has only to recall the consternation and terror caused by the yellow fever epidemic in this city (New Orleans), a few years ago, to remember that the mortality from this disease at that time was hardly 450 deaths. And such an epidemic is not likely to happen for many years, if ever again, while twice that number is sacrificed not only one year but year after year in that city.

Tuberculosis Compared With Great Disasters and Wars

In the volcanic eruption at Martinique 30,000 souls were destroyed in an instant and the world was appalled at the disaster; but this number was only one-fifth of the yearly destruction of life from tuberculosis in the United States. We think of the terrible catastrophe from the earthquake in Sicily, and yet hardly more lives were destroyed than are sacrificed every year from tuberculosis in the United States, and there may not be another

such destructive earthquake for a century, while tuberculosis with relentless certainty claims its great sacrifice every year. We speak of the destruction of human life from war, but twice as many died from tuberculosis in the eighteenth century as were killed in battle during the wars of that period. In the four years of our Civil War there were killed and mortally wounded from 155,000 to 161,000, which is not much above the *annual* mortality from tuberculosis in this country.

And so one might go on indefinitely reciting these ghastly statistics for country after country and city after city, until the sum total of annual deaths from tuberculosis throughout the civilized world would be found to be 1,000,000 or more, or 3,000 each day; and unless conditions change, eight to ten millions of people now living in this country are doomed to death by this plague. Still, however, the whole story is not told, for it has been estimated by Dr. Philip of Edinburgh, after a careful study of the subject, that the ascertained mortality in any city can safely be multiplied by ten in order to represent approximately the number of persons living already seriously affected, and even twice that figure, he thinks, would be still below the mark. In

this country (the United States), it has been estimated by good authority that 1,500,000 persons are suffering annually from tuberculosis.

One is led to inquire from all this enormous extent of tuberculosis, why it is that *anybody* escapes the disease? Indeed, the Germans have declared that everybody *does* become affected sometime or other in his life, though of course it does not follow that everyone who becomes infected with the tuberculous germs develops the active disease or even is ever aware that he has had the infection. Autopsies, however, performed upon persons who have died of other diseases often show evidence of tuberculosis which was all unknown to the individual in his life-time, and never produced any recognizable symptoms.

The Old Feeling of Hopelessness

For countless years tuberculosis has been reaping this rich harvest, and so continuously and silently, and yet so regularly has the sickle fallen that the magnitude of the crop was not and still is not realized; moreover, its victims, being ignorant of the cause of the disease and consequently of

its prevention, could only exclaim, "It is the hand of God, and we are powerless to avert it." "It is the flaming sword of the destroying angel!" But the beginning of the end was at hand, and after all these years it remained for Koch with his incomparable genius to reveal the true cause of the disease and to open the way to prevention.

The Saddest Fact of All

In the above portrayal of the prevalence and mortality of tuberculosis the whole extent of the calamity has not yet been given, and perhaps the saddest of all the facts connected with tuberculosis is yet to be mentioned. The reader may already have in mind the question which is now to be answered: "At what age do the majority of those whose death is caused by tuberculosis die?" Is it in infancy, youth, manhood or old age? For it makes a vast difference in the general and economic welfare of the community at what age so many deaths occur as those from tuberculosis. If in infancy or childhood, they are only potential factors in the community of workers; or if in old age, their contribution to the community has been made. Alas!

tuberculosis claims its victims in the best years of their life, for it is the sad fact that from one-fourth to one-third of all deaths between the ages of fifteen and thirty-five or forty years result from this disease. In Germany almost one-half the deaths occurring between fifteen and forty years of age are from tuberculosis, reaching this proportion most nearly between twenty-six and thirty years. In England and Wales, between the ages of fifteen and thirty-five a little less than one-third of all deaths are due to tuberculosis. In this country in the registration area, that is, in those states where vital statistics are accessible, of all deaths occurring in 1907 nearly a third (33.2 per cent.) between the years of fifteen and twenty-nine were due to tuberculosis in some of its forms, while the deaths from pneumonia, a very prevalent disease, were only 6.7 per cent. during this age period. For mature manhood and womanhood (30 to 44 years) over one-fourth (25.6 per cent.) of all deaths were due to tuberculosis, while the deaths from pneumonia were only 8.8 per cent. For the age period of forty-five to fifty-nine years, the mortality is 12.1 per cent., for at this period other diseases, such as heart

and kidney disease, cancer and other so-called degenerative diseases become more frequent.

It is seen, then, that the majority of deaths from tuberculosis occur at the most valuable period of a person's life, the working, the reproductive period, the age when the life of the individual is of the greatest economic value to the community, and his death of the greatest economic loss. This fact is, perhaps, the saddest of all the grim facts connected with the ravages of tuberculosis. "The world is forever poorer," said Dr. Wilbur,* "on account of the untimely death of Robert Louis Stevenson, though richer for the record of his brave fight against the unrelenting foe, tuberculosis, that harried him to the islands of the great 'South Sea' he loved, and slew him there. What would have been the value to literature of a few more years of this single life! and how many are now dying from tuberculosis who, were they but permitted a few more years of healthful life, would by their works of genius add immensely to the treasures of humanity. Tuberculosis kills men and women chiefly in the most active, most productive period of life, when their work is

* Tuberculosis in the U. S. Bureau of the Census.

worth the most to themselves, to their families, and to the world."

Tuberculosis and Pneumonia Compared

In comparing pneumonia, which has been referred to above, and whose mortality is quite equal to and sometimes a little above that of tuberculosis, with the latter disease, we find this startling difference: that whereas pneumonia destroys the majority of its victims at the two extremes of life,—the young child before it becomes economically and socially valuable and before it has received a more or less expensive training for its life work, and the old person who has completed his work and made his contribution to society,—tuberculosis, on the other hand, gathers its harvest between these extremes: it "loves a shining mark." It clutches in its relentless grasp the young man just established in his profession or trade, the young mother in her family, the father upon whose working ability the wife and family depend, the young college graduate with anticipations of high achievement, or it cuts off the genius who has already become famous, in the midst of his career. So it happened to the German poet

Schiller, and to Keats, the sweet English singer; to the nature-loving Thoreau, and to the musicians Chopin and Weber. It is in adult life that we accomplish our main life's work. As Dr. Osler tells us, our principal creative work and achievements are completed at forty years of age. It is just at this infinitely valuable period that tuberculosis does its fatal work, and that is what makes the disease so dreaded and so destructive.

Economic Loss From Tuberculosis

Consider for a moment, in terms of dollars and cents, the prodigious economic loss entailed upon the community by tuberculosis. In the United States it has been estimated that the money loss from tuberculosis is $1,235,000,000 a year; in France, $200,000,000 a year; in Canada Dr. Richer estimates the loss at $72,000,000, and in New York City Dr. Biggs has estimated that the annual loss to the city from tuberculosis is $23,000,000. The total annual loss to the State of Illinois after a very fair and conservative estimate based upon statistics has been placed at $36,551,000. England, in fifteen years, has expended $600,000,000 in combating tubercu-

losis and has saved 876,581 lives thereby, or in round numbers $685 apiece. Dr. Newsholme, a health officer of England, estimates that in Wales alone by the abolition of tuberculosis in that country not far from $50,000,000 annually could be saved. "And this," he says, "makes no allowance for the loss sustained by protracted sickness, nor for the further loss from premature death of women from the same cause."

Mr. Hoffman, the statistician of the Prudential Insurance Company, says that the annual cost of deaths from tuberculosis to that company, on a basis of three years' experience, is $800,000. Cornet, the German authority, estimates that the deaths from consumption in Prussia, if we reckon only one year of invalidism when the sufferer cannot work, cost that country $23,000,000 annually, and this does not take into account the added years of life and remunerative employment which would follow if consumption were banished. One can, to a degree, understand how such enormous losses occur if he considers the amount expended upon education and preparation for work; the value of the workman when he has been prepared for his life's work,

which, at a very conservative calculation, has been estimated to be $1,500, and the value of his work, his support, care and nursing during the period before his death when he is unable to work; and then there must be added to this, in so many cases, the support of the family left behind, who have been deprived of their bread-winner.

Dr. Newsholme thus admirably states the economic value of lives lost during their best working period: "Each child," he says, "until he is able to support himself, is having expended upon him, time, money and effort which may be regarded as so much capital invested with a prospect of future returns. If he dies in infancy, the measurable loss is much less than if the death is postponed until the age of fifteen. Between the ages of fifteen and twenty, it is probably exceptional for the earnings to more than balance personal expenditure, and, if this is so, all deaths up to the age of twenty may be regarded as involving a serious loss of capital expenditure. During the next five years, a large proportion of the population marry and thus incur new obligations before the balance against them can possibly have been paid off. It is

during the following thirty or forty years that he can hope to pay back the value of his own earlier maintenance by personal savings and by investing capital in the formation of a home and the upbringing of a family in his turn. Each family represents in this respect an investment on the installment system, and the only hope of completing the investment and leaving no debt for the survivors to redeem or owe to the community, is for the worker to live and remain able to work until all his children are able to earn their livelihood, and until his wife and himself can maintain themselves in their old age. This can only be realized when the worker is not cut down by illness or killed by disease or accident. Hence the immense economic significance of the fact that among men nine out of every ten deaths from tuberculosis occur between the ages of fifteen to sixty-five."

In the above consideration we have been attempting to estimate the loss from tuberculosis in terms of economic value, in money, but who can estimate the suffering, the poverty, the sorrow, the blighted hopes, the loss of personal influence, the severed friendships entailed by this ever-present, cruel disease,—

a disease whose cause is now known and which is preventable. Thirty years ago, the world first learned this incomparably precious fact, and this dark picture of the awful ravages of tuberculosis was illumined by the light of knowledge and hope. Again may Louis Pasteur's great saying be repeated: "It is in the power of man to cause all parasitic (germ) diseases to disappear from the world." It is in the power of man to banish tuberculosis.

Effect Upon Different Races

Tuberculosis does not afflict all races or the sexes equally. Certain races seem to be more susceptible to the disease than others. In some cases it may be a true racial susceptibility, while in others it may be the conditions under which the race lives and their personal habits.

Thus, the colored race in the United States has at the present time at least four times the mortality as the white race, whereas before the Civil War the disease was rare among the colored population. As slaves they lived a healthy outdoor life, in the country, and were well fed, clothed and lodged, for they were

valuable property and it was for the commercial interest of their owners to take good care of them. Since emancipation they have had no one to overlook, with such interest, their physical well-being; they have flocked to the cities, have had more confined work in factories and workshops, with long hours of work, poor pay, and often insufficient food; they were ignorant of the principles of sanitation, and have had access to cheap liquor. Environment, ignorance and the abuse of alcohol would seem to be the important factors in producing this high mortality from tuberculosis in this race.

Again, tuberculosis is more prevalent in the Irish than in any other European race. This is especially true with this race in the United States. Dr. Flick thinks this is due to a racial susceptibility. Probably also the greater confinement indoors in this country, and the addiction to alcoholic liquors of this race play an important part.

The Indian when brought in contact with civilization shows a large mortality from tuberculosis. This is ascribed, and probably with truth, to the "disastrous effect of civilization upon a savage race." How true it is that it

requires both education and experience to avail one's self of the benefits of civilization and avoid its evils.

In this country the Bohemian, the Scandinavian, the French, the German, the Scot, and the Canadian come next respectively in order of mortality, while the Italian and the Jew are lowest in the scale. Throughout the world the Jews have a comparatively low death rate from tuberculosis. This has been attributed to a genuine racial resisting power to this disease and also to their well-known temperance, particularly in the use of alcoholic drinks.

Sex and Tuberculosis

With regard to the influence of sex upon the mortality from tuberculosis, at the present time the male mortality is somewhat in excess of that of the female. In earlier years, however, both in England and in the State of Massachusetts, where alone statistics upon this point were at hand, the reverse was the fact. One of the reasons for this change may be the increased outdoor life which has become popular among women of late years, and another, the general movement now going on

throughout the civilized world for the physical and social amelioration of the condition of working-women. Furthermore, the enormous increase in manufacturing, and the consequent congestion of population has added to the risks to life and health of the male laborer. The early simple life was as conducive to physical well-being as to moral and spiritual health.

II. WHAT IS TUBERCULOSIS? ITS NATURE AND CAUSE

TUBERCULOSIS is a disease which may affect any part of the body and is characterized by the formation of "tubercles" which are at first tiny bodies or nodules detected by the microscope and which increase in size as the disease advances. These tubercles destroy the tissues in whatever part of the body they occur, and, if in the lungs, where they are most commonly found, their tendency is to ever extend their field of destruction like the march of an invading army.

Description and Location

Different names are often given to tuberculosis as it affects different parts of the body; thus, tuberculosis of the hip is called "hip joint disease"; tuberculosis of the knee or ankle, "white swelling"; of the skin, "lupus"; and of the glands of the neck, "scrofula." In other cases we simply speak of tu-

berculosis as of this or that part of the body, as tuberculosis of the bones, the kidneys, throat, bowels, etc. Tuberculosis of the lungs, called "consumption" or "phthisis," is the most common form of the disease, nearly nine-tenths of all tuberculosis being that of the lungs.

It is in fact a very old disease, and like other infectious diseases, nobody knows how or when it had its origin. Somehow it was evolved in the process of civilization like many other evils, and is one of the penalties we have to pay for the many good things civilization has brought us. "It is a disease of all times, of all countries, and of all races." Hippocrates, a renowned Greek physician who lived about 400 B. C., gave a very excellent description of the disease, and from that time to the present medical writers have recognized and described it.

The cause of tuberculosis was ascribed to various influences: thus, Hippocrates thought it was due to some poison in the air wafted by the winds from one place to another. Other old writers upon the subject ascribed it to the use of chimneys in houses, to smoke from wicks of candles, excess of animal food, and

to tight lacing and stays. A keen and wise observer was he who ascribed it to this latter cause. It seems almost startling that the world should have remained all these hundreds of years in ignorance of its cause until a man recently living, finally in the fullness of time, discovered the true cause and proved it so perfectly and completely that no one has ever been able to disprove it.

Dr. Koch's Discovery

It was in 1882 that Dr. Robert Koch made this marvelous discovery; the hour and the man had arrived and the great light shone. The blessings which this discovery has conferred upon humanity, and will continue to bestow as time goes on, are almost incalculable, for all our direct measures for the prevention and control of tuberculosis depend upon the knowledge of its cause.

The manner and method of Dr. Koch in making this discovery are of intense interest. Villemin, a French investigator, had successfully demonstrated in 1865, by experiments upon animals, that tuberculosis was infectious, or, to use a better term, " communica-

ble," but he did not discover the cause of the infection. Many others at earlier dates had also believed in the infectious nature of the disease and stringent laws were enacted regarding its isolation, and disinfection: thus, in 1638 Lazarus Riverius, who wrote a book on medicine called "Practice of Physik," says: "Moreover, there are causes of tuberculosis of the lungs, as contagion, which is the chiefest, for this disease is so infectious that we may observe women to be infected by their husbands, and men by their wives; and all their children to die of the same, not only from heredity, but from the company of him that was first affected."

By means of modern bacteriological methods, the improved compound microscope and his own genius, Dr. Koch, after many unsuccessful attempts, finally demonstrated the microscopic germ called the "tubercle bacillus," which is a rod-like structure, a microscopic fungus, so small that it requires from eight to twelve thousand placed end to end to measure an inch, and 900 of them can be placed on the point of a small sewing needle, or 4,000,000 on a postage stamp. How marvelous the delicacy and power of the

modern microscope which will enable us easily to detect this infinitesimally tiny germ!

In the first place, Dr. Koch, by methods of staining and the use of the high-powered compound microscope, found this tubercle bacillus in every case of tuberculosis, in whatever part of the body the disease existed, and in the sputum of consumptives. This he did by the examination of the diseased tissues. He never found it in other diseases or in healthy tissues. He next, by means of the methods bacteriologists employ for cultivating germs, very like the growing of crops on suitable soil, grew a crop of the tubercle bacilli upon what might be called germ soil, the scientific name of which is "media." The next step, the most important one of all, was to prove that these artificially grown bacilli, freed, by a series of transplantations, from all products of disease, and all other germs, a "pure culture," as it is called, would produce the same disease, tuberculosis, whence they came. For this purpose, he inoculated a large number of guinea-pigs, rabbits, and cats with this "pure culture" of tubercle bacilli, and also sprayed a solution containing the bacilli into a large box containing rabbits,

guinea-pigs, rats and mice, and in every case he produced tuberculosis exactly like the original disease from which the germs were first obtained. Furthermore, he injected into hundreds of guinea-pigs and rabbits various substances, diseased tissues caused by other diseases, etc., and never once produced tuberculosis. This famous demonstration was repeated again and again by other investigators and was always corroborated.

Value of Animal Experimentation

We hear much in these days of the evils of vivisection and experiments upon animals, but when one considers the inestimable boon conferred upon mankind by the discovery of the tubercle bacillus, was not the sacrifice of a few animals a thousand times justified? "Everything that has a direct bearing on the prevention of tuberculosis," says Dr. E. L. Trudeau, one of the foremost pioneers and investigators in the great movement against tuberculosis, "everything that has changed mankind's attitude towards it from one of apathy and hopelessness when the infectious agent which produces tuberculosis was unknown and the disease was thought to be in-

herited and always fatal, to the growing hope of its ultimate conquest . . . we owe to animal experimentation."

The new light had at last arisen after so many centuries of groping in the dark, the true cause of tuberculosis was at last revealed, and science had triumphed. All honor to the great investigator who after years of patient and discouraging labor in his laboratory had at last succeeded! We extol the great captains of war who have waged successful campaigns. How much more should we esteem those great investigators, like Pasteur and Koch, whose victories mean not suffering and death, but the preservation of life and the conquering of disease.

Nature of the Tubercle Bacillus

In investigating the nature of the tubercle bacillus, it was found that it did not grow and multiply outside of the body, but that it would live a considerable time, for weeks or even several months, in dark, damp, dirty places; that it was readily and quickly destroyed by sunlight, and that daylight and fresh air would, after a while, kill it, or at least render it inactive; that a high temperature, that of

boiling water, for instance, and certain disinfectants would also destroy it; but that it survived a freezing temperature.

Having discovered the cause of tuberculosis, the next inquiry was, how was this germ, the tubercle bacillus, conveyed, or, in other words, how was tuberculosis caught? Not by the mere contact with a person who is suffering from the disease, as seems to be the case in the acute infectious diseases, such as small-pox or scarlet fever; nor by the breath, as is sometimes erroneously supposed, but by the only means by which the bacilli can escape from a consumptive person, namely, through the expectoration, or in coughing, when tiny drops of sputum are thrown out, which experiments have proved can contain the bacilli.

Dry Sputum Alone Dangerous

As long, however, as the tuberculous expectoration is mixed with the moist secretions, is wet, the bacilli are imprisoned in this moisture and cannot escape. It is only when the moist secretions, the sputum, becomes dry that the germs are set free and mix with the dust in the air; then the danger begins. From the foregoing it is obvious, then, that a con-

sumptive who does not have any expectoration, as is not infrequently the case in the very early stages of the disease, can give out no bacilli and consequently is not a source of any danger. It also follows that when all the expectoration is destroyed before it becomes dry, there is again no danger, and also when the consumptive holds a cloth or some article before his mouth when coughing, there are no tubercle bacilli thrown out into the air.

How to Control the Disease

The way of the prevention and control of the disease would seem plain and easy, or it would be easy if we could always control the consumptive. This, however, alas! is easier said than done, for we have to deal with all sorts and conditions of consumptives, some ignorant, some careless, some wilful, and some who do not know that they are suffering from the disease. It is only by education, constant watchfulness, the prevention of indiscriminate spitting, and in many cases by the removal to a hospital, and thus isolating the consumptive, that we can ever hope to control the disease. It can be done, however, and great progress has already been made. It all de-

pends upon the energy, determination, and contribution of money, effort and time which the people are willing to make.

How many germs must enter one's body before tuberculosis is produced we do not know. Much, undoubtedly, depends upon what we call the susceptibility of the individual. So far as we can judge from experience, it takes a good many germs and a considerable time to become infected. In many cases it is believed that the bacilli remain in the body for years all unknown, and without causing any symptoms, and then, upon a favorable occasion, when the individual, from some depressing influence, like over-work, some disease, such as an attack of influenza, some excess, etc., becomes susceptible, the latent bacilli spring into life and active tuberculosis results. It is now a generally accepted theory that most human beings contract the infection of tuberculosis in childhood.

A "House Disease"

Observation, again, has taught us that the disease for the most part is contracted by long and close intimacy with a person suffering from it, and who does not properly destroy his sputum before it becomes dry; hence, we call consumption a "house disease,"

for it so often happens that when one member of a household is suffering from the disease, others in the family contract it. If it is the father or mother who has tuberculosis, some of the children are often found to be suffering from it. Again, it is not of infrequent occurrence that a workman who, day after day, pursues his occupation in close intimacy with a fellow-workman who is a consumptive and who is careless in the disposal of his sputum, contracts tuberculosis.

A momentary exposure to an atmosphere containing bacilli is probably not a source of danger. There must be a longer exposure than that. There is an erroneous impression that the tubercle bacilli are so universally distributed that we are exposed to them every day and everywhere, as a lawyer once remarked to a physician on the witness stand: "I suppose there are germs of tuberculosis all about this court room." On the contrary, researches upon this point all tend towards the conclusion that in rooms which are clean and in which the atmosphere is quiet, there are no bacilli floating about.

Why, then, one might pertinently ask, do we require such stringent measures against

indiscriminate spitting upon the sidewalks and in public places and vehicles? Because, if everybody expectorates upon the sidewalk there is sure to be someone who is suffering from tuberculosis, and the passer-by can easily carry some of the infected sputum into his house on his garments or his footwear. Children play upon the floor, babies creep on the floor, and they frequently put their fingers in their mouths; thus they may become infected.

How Bacilli Enter the Body

The next question, and one that is not yet settled, is, through what channels the bacilli enter the body: do we breathe in the germs, take them into the digestive tract through contaminated food, or drink them in infected milk? So far as experience and experiment permit us to say, the bacilli gain entrance into the body through (1) *inhalation,* breathing them into the lungs, and through (2) *ingestion,* taking them into the stomach and intestinal tract with the food. Some authorities think one way is the more frequent and some the other. In the author's opinion the experimental evidence seems to be greatly in

favor of the inhalation method of infection. Practically it makes but little difference which is the more common way by which the bacilli enter the body, for if the tuberculous sputum is destroyed before it becomes dry and gets into the atmosphere there can be no danger of infection by either way. There is also a third channel through which the bacilli may enter the body, and that is through the skin when it is broken, or through a wound. This is called the *inoculation* method. A person with a wound upon his finger, for example, may handle tuberculous tissue or sputum and through the wound become infected with the disease. This form of infection happens so rarely, however, that it may be disregarded in the consideration of the subject.

Infected Milk

Milk has been mentioned as a source of infection, for when it is obtained from tuberculous cows it is not infrequently found to contain the bovine tubercle bacilli. It was formerly supposed that milk was a common carrier of infection, and that children whose diet consists principally of this substance often become infected in this way. Many health au-

thorities in cities required dairy herds to be "tested," as it is called, by tuberculin, which almost invariably proved the presence of tuberculosis when it existed. At the present time there is much difference of opinion among investigators as to whether or not the kind of tuberculosis from which cows and other animals suffer can be conveyed to human beings. Koch, the discoverer of the human bacillus, has, from his investigations, concluded that it is an uncommon occurrence for the "bovine bacillus," the germ which produces tuberculosis in cows and cattle, to produce the disease in man. Other able investigators have come to a different conclusion, and a few believe that milk containing the "bovine bacillus" is the principal source of infection. So the question remains unsettled at the present time. It is generally believed, however, that gland tuberculosis in children, called scrofula, is caused by the bovine bacillus.

So long, however, as the possibility exists of infection through milk, the only safe method to pursue is to continue the precautions already adopted, of testing all cows periodically whose milk is used for domestic purposes, and to maintain a rigid milk inspec-

tion. At the great International Congress on Tuberculosis held in 1908 in Washington, the following resolution upon this point was adopted: "Preventive measures must be continued against bovine tuberculosis, and the possibility of the propagation of this to man should be recognized."

III. TUBERCULOSIS A CONTAGIOUS OR INFECTIOUS DISEASE: WHAT THIS MEANS

What is a Contagious or Infectious Disease?

BOTH of the terms contagious and infectious are commonly used interchangeably and practically mean the same thing. They are applied to diseases which are conveyed from one person to another by means of some substance or germ, known or unknown, either directly by contact with the person or germ or through the medium of something which has become infected by the individual who is suffering from the contagious disease, whatever it may be. Thus, for example, clothing, the furnishings of a room, or some article used by the infected person, may receive the infectious material or germs and anyone who handles these articles may in turn contract the disease. Small-pox is a familiar example of this form of con-

tagion. Mosquitoes, flies, and other insects may also be the medium through which contagious or infectious diseases are conveyed: thus, a peculiar kind of mosquito carries the infectious material of yellow fever in its body, and flies carry the germs of typhoid fever and other diseases.

Acute Infectious Diseases

When one speaks ordinarily of infectious or contagious diseases he has in mind those which are acute and occur in a few days after an exposure to them, such as scarlet fever, measles, whooping cough, or diphtheria. The relation of cause and effect is so obvious and the effect follows so closely upon the cause, that one is impressed with the fact, and, quite naturally, when he hears the word contagion, thinks only of this acute form of infection. The acutely contagious diseases may be contracted by a short exposure to them: thus, for example, a child who comes in contact with another who is suffering from scarlet fever or measles, even though it may be for a very short time, often contracts the disease if it is in a susceptible condition, or has not gained immunity from a previous

attack. We therefore isolate persons who have acute infectious diseases for the protection of others, and when they have recovered we disinfect the sick room for fear that infectious germs may be lurking about the furniture or walls of the room.

With many, if not most of the acute infectious diseases, we do not know how the infection is given off or how it enters the body of another person. Consequently, we take great care to avoid those suffering from such diseases. Ignorance of the cause of evil always makes one more apprehensive regarding it. We fear, often unduly, the enemy whose method of attack and of inflicting injury we are ignorant of.

Chronic Contagious Diseases

Besides the acute contagious disease, there are also chronically contagious ones, of which leprosy and tuberculosis are the best examples. Such diseases, although contagious or infectious, are not conveyed through a momentary exposure to them; but is only by long contact or intimate, continued association with individuals suffering from them that we become infected, and then, probably, only when

we are in a so-called susceptible condition. We see, then, that there is a very great difference between the two kinds of contagious diseases—the acute and the chronic. There is very little, if any, fear that we shall contract the latter—the chronic contagious diseases—by a momentary exposure to their infection.

In the case of tuberculosis, we are not in ignorance of the way in which the infection is given off or how it is conveyed to another, as is the case with most of the acute infectious diseases. We know that the sputum is the only way by which a tuberculous person can infect another, and then only when it is allowed to become dry before it is destroyed, or when a consumptive does not hold something before his mouth when he coughs; we need have no fear then of a clean consumptive, one who properly and safely disposes of his sputum.

In sanatoria or hospitals for the tuberculous, it is a rare occurrence for the physicians or attendants to contract the disease, because strict precautions are observed in destroying the sputum. The dust has been examined in such institutions and no tubercle bacilli have been found in it unless some patient has

been neglectful of the rules in regard to properly disposing of the sputum. On the other hand, Cornet, a German physician, and many other investigators have found in the dust of rooms occupied by unclean consumptives, particularly in rooms which were dark and damp, the tubercle bacilli, even days or weeks after the consumptive had died or been removed from the room. Cornet's conclusions are of importance in discrediting the popular opinion of the ubiquity of the tubercle bacillus. He says: "The tubercle bacillus is found, as a rule, only in places in which an uncleanly consumptive maintains himself; otherwise, it occurs but rarely."

This fact is of vast importance also in our efforts to control and prevent the disease, for it shows us that our main work must be in the home of the consumptives. When viewed from the standpoint of prevention, the protection of the family of the consumptive is of far greater importance to the community than the care or even the cure of the consumptive himself. If the consumptive is not or cannot be made to safely dispose of his sputum, he must be removed to a hospital and his children must be kept constantly under observa-

tion, and in some cases removed from their homes.

"Consumption Terror"

It is unfortunate that the terms contagious and infectious have been applied to tuberculosis, as true as it is; "communicable" would have been a better term, for the distinction in the conditions of infection between an acute and chronic contagious disease, as has been pointed out above, is not clearly recognized in the popular mind. Because tuberculosis is called contagious, it is often classed in the same catagory as the acute contagious diseases, and the same fear has been aroused as in regard to the latter diseases. This fear has led to a great injustice being done the poor consumptive: he has been shunned and treated as if he were a leper, or suffering from an acute infection. This "consumption terror," as it has been called, has not only been the means of inflicting great hardships and suffering upon the consumptive himself, but has seriously interfered with the general work of prevention.

For instance, it has not infrequently happened that the establishment of sanatoria or

dispensaries for tuberculosis has been opposed or rendered impossible by those living in the neighborhood on account of this unreasonable fear, whereas, carefully collected statistics have shown that the mortality from tuberculosis has been reduced in places where sanatoria have been established. For example, in Goerbersdorf and Faulkenstein, where several sanatoria have existed for many years, the death rate from consumption has markedly decreased. This has been brought about by the example set by the sanatorium of a high standard of sanitation and hygiene, which was imitated by those living in the neighborhood. Again, it is often difficult for a consumptive and his family to obtain a dwelling or a tenement on account of the "consumption terror," or a consumptive workman may lose his position through the "consumption terror" on the part of his fellow-workmen.

An incident was recently related of a consumptive tailor who expectorated upon the floor of the shop, about him, although he knew better, for fear that he would lose his position if he was observed to use a proper receptacle for his sputum. In many hotels, particularly in health resorts, consumptives

are not received under any condition, and are often almost cruelly turned away. This is not so much the fault of the proprietors as the unreasoning fear of the guests. Even consumptives who have been discharged from the sanatorium with their disease cured, often find it difficult to obtain a position if the fact is known. The unfortunate consumptive often suffers more from this heartless, ignorant, cowardly fear than he does from the disease itself.

The Only Way Consumption is Conveyed

It is therefore of the highest importance that everyone should remember that it is only the expectorated sputum of the consumptive, and that alone, which contains the infecting material, the tubercle bacilli, and which can carry the disease from one person to another, and that when this sputum is destroyed before it becomes dry, the consumptive is harmless. Furthermore, no one need fear that he will become infected by coming in contact with a consumptive for a short time; or staying with a consumptive who does not cough, or who properly disposes of his sputum. It may well be repeated again that to be infected by tuber-

culosis, one must for a considerable time live or work continuously with a consumptive who coughs and who is not careful in the disposition of his sputum. The Swedish National Anti-Tuberculosis Association has thus admirably summarized the evils of the "consumption terror":

The "consumption terror" paralyzes the struggle against tuberculosis.

The "consumption terror" prevents consumptives from taking care of themselves.

The "consumption terror" renders all measures against tuberculosis more difficult.

The "consumption terror" facilitates the spread of infection.

The "consumption terror" causes us to overlook the real danger.

The "consumption terror" is a sign of shameful cowardice.

The "consumption terror" causes cruel behavior to consumptives.

The "consumption terror" is an enemy to society that must be opposed.

IV. INHERITANCE AND IMMUNITY

DR. HOLMES somewhere wittily says that in order to produce a high type of human being, "a man should be careful in the selection of his ancestors." The work must have its beginning with the grandparents or great-grandparents. In other words, he evidently meant to say that inheritance played a very important part in the moral, physical, and intellectual welfare of a man. Inheritance does, undoubtedly, exercise a very material influence in shaping one's career and character, as the new science of eugenics teaches, how much, no one knows; but we often ascribe to it many defects in the moral and physical condition of a person, for which it is in no way responsible and which are within his own control. So it has happened with regard to diseases, the cause and origin of which we were ignorant. Either "providence" or inheritance were often made the scapegoat for many diseases which

afflicted mankind, the real cause of which was their own ignorance or disregard of nature's laws. It was so with regard to tuberculosis. The universal belief was, that it was an inherited disease, and even now, with the knowledge of its cause, one frequently hears the old inheritance doctrine asserted, such is the tenacity of old and long-entertained ideas.

The Old Idea Versus the New

It was very natural, however, that in the dark days of tuberculosis, as we might call the time before the discovery of the true cause, one should thus explain the frequent occurrence of several cases of the disease in the same family, when one member after another succumbed to it. "How else can this be explained," one said, "except by inheritance?"

With the discovery of the fact that tuberculosis was an infectious or communicable disease caused by a germ, all was made clear and the inheritance theory became untenable. Not knowing that the fatal germ, the tubercle bacillus, lurked in the sputum of a consumptive, no care was taken to destroy it before it became dry, and so the disease was com-

municated to others who were in constant attention upon, or in intimate, long-continued relation with, the consumptive.

What was ignorantly regarded as inheritance was simply infection. The disease was *caught* through the germs, *not inherited,* and so, alas! it went on being communicated, until Koch's discovery removed the veil of ignorance and enlightened the world as to the true nature of the disease, and the danger from the dried sputum.

What is "Inheritance"?

Still, however, we retain the word inheritance, with regard to tuberculosis, but with a different meaning. We say now, that a tendency to it, or a predisposition to it, is inherited, that when a person has tuberculosis "in the family," when, for example, his father or mother has died of it, he may have inherited in consequence a tendency to the disease and is more likely to contract it when exposed to the bacilli.

The occurrence of tuberculosis in the family of one suffering from the disease, either on the father's or mother's side or on both, is so frequent that the inheritance of a predispo-

sition to the disease would seem to be evident. It must be remembered, however, that the opportunities for contracting the disease in a household where some member is suffering from it are naturally greater than when no such case exists, for, unfortunately, there are still many homes where the dangers from the dried sputum are still not fully realized. What, therefore, we ascribe to inheritance, is, undoubtedly, in many cases only the result of greater opportunities for infection.

It may be that a special susceptibility to tuberculosis is really inherited, but, on the other hand, the true fact may be only this, that the children of consumptive parents, especially of a consumptive mother, are not as robust and resistant as those whose parents were well and strong when they were born, and hence, they are more susceptible to any infectious disease, including tuberculosis, and, furthermore, if the tuberculous parent is living with the children in the same household, the opportunities for infection are greater, as has been said.

The practical lesson from all this is, that weakly children should receive especial attention and very effort made to build up their

strength and health and increase their resisting power to disease, and, secondly, they should be removed from sources of infection. A consumptive mother should not nurse her baby, or children should not be permitted to live in intimate association with consumptive parents or relatives. Moreover, all the children from a household where a case of tuberculosis exists, should receive a careful examination from time to time. Where this has been done, as is now the custom in tuberculosis dispensaries, unsuspected cases have been discovered, and when the disease is detected and treated in its beginning, as will later be shown, the cure will generally follow.

Predisposition and Immunity

We now also use the word "predisposition" in still another sense. We speak of an "acquired predisposition," which means that an individual may by various unwholesome influences of living and unfavorable environment (which will be considered more at length in the next chapter), so reduce his resistance to disease that his system readily yields to infectious germs of any kind when exposed to them, and among them, to the germs of tuberculo-

sis. Such an individual, we say, has, by his faulty method of living, acquired a "predisposition" to the disease. He has lowered his resistance either permanently or temporarily. Upon this fact of lowered resistance is based the modern method of treatment of tuberculosis, which consists, in brief, in placing the patient under such favorable conditions of living that his system will regain this lost resistance to disease and re-establish what we call his natural "immunity."

Every individual possesses within his body to a greater or less degree a natural tendency to resist disease. This inborn tendency we call one's natural "immunity." When any poisonous or infectious germ enters the body, a defensive army is set in operation within the body which endeavors to destroy or limit the influence of such germs, and the activity of this opposing army depends upon the degree of immunity the individual possesses.

The white blood cells called "leucocytes" possess the power to a greater or less extent of destroying infectious germs. This they do by enveloping or eating them up, so to speak. This process is called "phagocytosis" and was first demonstrated by a famous

French investigator, Metchinkoff, who is the successor to the more famous Pasteur.

It is a very wonderful provision of nature that when any infectious material enters the body, the number of leucocytes or white blood cells are generally increased. Nature calls out her reserves as the danger arises or increases. When, in any infectious disease, we find a large increase in these scavenger cells, the leucocytes, we say the fight is going on well, but, when, on the contrary, there is no increase, we are fearful of the result. Pneumonia is a good illustration of this process. When by microscopical count the blood shows few leucocytes, we give a grave prognosis. Further investigation has shown that other cells and fluids of the body also assist in this work of destroying or rendering inactive infectious germs, and there still remains much to be learned about all the causes of natural immunity.

Antitoxins and Vaccines

As is well known, we can also inject into the body various antitoxins or vaccines which will further increase the defensive barriers of the body and neutralize or destroy the

toxins or poisons produced by the various specific bacteria or germs, will produce an artificial immunity. This we do with success in diphtheria by use of the well-known diphtheria antitoxin, and in tetanus, or "lock-jaw," with more or less success by the tetanus antitoxin, and in cerebro-spinal meningitis by its peculiar antitoxin.

The great goal toward which the modern medical world is now striving is to discover antitoxins or vaccines for all infectious diseases, so that, for example, when pneumonia, scarlet fever, and other diseases, caused by specific bacteria or germs, occur, we may vaccinate or inject into the body the proper antitoxin or vaccine for each disease and thus cut short its course, just as we now successfully do in diphtheria. Many attempts have been made to discover an efficient antitoxin or vaccine for tuberculosis, but as yet it has not been found. Maragliano, a celebrated Italian physician, thought he had discovered such an antitoxin or serum, and so did Von Behring, the man who discovered the diphtheria antitoxin. Dr. Trudeau also, the greatest investigator in this country upon tuberculosis problems, has, for many years, been

working in this direction and so have many others. None of these men, however, has as yet produced an antitoxin which can in any degree do for tuberculosis in the human being what the antitoxin does in diphtheria. Still, however, these illustrious investigators patiently work on with a host of others, and we may hope that eventually success will come and the true tuberculosis antitoxin be discovered.

"Tuberculin," a sort of serum or antitoxin made from the tubercle bacilli, originally prepared by Koch, was at first thought to be a genuine antitoxin for tuberculosis, and when Dr. Koch first gave it to the medical public, consumptives flocked to Berlin to be treated with the marvelous specific, as it was then supposed to be, and physicians from all over the world were besieging Dr. Koch for some of the precious substance for their consumptive patients. Hope was high that at last the great physician who had discovered the cause had also discovered the remedy. Alas! both physician and patient were doomed to cruel disappointment. The tuberculin did more harm than good, for many lives were sacrificed in an overzealous use of it in almost poisonous doses. The awakening soon came

and the supposed specific, tuberculin, was abandoned as suddenly as it had leaped into favor. Subsequent experience, however, has apparently shown, that, employed in infinitely small doses and with proper cases, it has more or less value when used in connection with the open-air treatment. Its effect seems to be to increase the resisting power of the individual.

Tuberculin, when used with animals, seems to give immunity to the tubercle bacillus. Koch, Dr. Trudeau, Von Behring, and others have obtained such a result in their experiments with animals. But it has often been found that what has succeeded in animal experimentation has failed in human beings, although it must not be forgotten that, on the other hand, animal experimentation has led to many discoveries which have conferred lasting and great benefits upon mankind.

Immunity in Acute Diseases

It has been thought and there are some facts which appear to corroborate the belief that sometimes one receives from parents who have died of tuberculosis an immunity to the disease. If this is really so, it unfortunately

happens but rarely. With the acute infectious diseases, however, like whooping cough, measles, etc., a single attack generally produces an immunity to subsequent attacks of the same disease. But this, as we know, is not the case with the chronic infectious diseases. How fortunate it would be if, having recovered from tuberculosis, one was assured, in consequence, that he would never suffer from it again and there is some evidence to show that a tuberculous focus somewhere in the body or a slight tuberculous infection does produce a partial immunity. At the present time, then, we can only strive to increase the natural resisting power, the " natural immunity " of the individual, and hope that future investigations and research may bring us the much-desired antitoxin or vaccine for tuberculosis.

V. THE SEED AND SOIL

TWO things are necessary in order to contract a contagious disease, whether it be an acute or a chronic one: the one is the presence of the infection—the germs of the special disease—and its entrance into the body in a sufficient quantity; and the other is a receptive state in the individual. Not everyone who is exposed to an acute infectious disease contracts it, as we know, and, likewise, not everyone who is exposed to the infection of tuberculosis—the tubercle bacilli—becomes a victim to it. Neither, on the contrary, can anyone, however receptive his condition may be, contract tuberculosis, or, indeed, any contagious disease, unless he is exposed to the germs of that disease. No matter how susceptible the individual or how little his resistance, how unfavorable his environment or how unhygienic the conditions may be, if the specific micro-organism is absent tuberculosis is impossible.

Two Things Necessary to Contagion

Some years ago there was no tuberculosis in Iceland, and yet the inhabitants of this island lived under the most unfavorable and unhygienic conditions. The winter was long and dreary, and the sky cloudy and the atmosphere filled with dampness. Their dwellings were small, dirty, dark, and unventilated, each person having scarcely ninety-nine cubic feet of air to breathe. These abodes were filled with foul-smelling vapor rising from the débris of fish lying about the door, and the smoke from dried dung which constituted their fuel. Their food consisted mainly of dried fish which had begun to putrify, a preparation of milk called "sky," large quantities of rancid butter, and sour whey mixed with water; they also drank large quantities of alcohol. Their occupation was one of exposure in fishing, bird hunting, and sheep and cattle herding. Their feet were constantly wet. In spite of this extraordinarily unwholesome and pernicious condition of existence, no case of pulmonary tuberculosis existed. The susceptible condition was undoubtedly present, but the tubercle bacillus was absent. Whenever any of the Icelanders migrated to the mainland

of Denmark tuberculosis was extraordinarily frequent among them, as one would expect, for then occurred the union of the favorable soil, the susceptible condition, produced by the unhygienic life of the Icelander, with the tubercle bacillus existing in Denmark.

We must have, then, both good seed and a favorable soil, a soil suited to the growth of the seed, in order that a crop may be produced and come to maturity. The seed must fall upon "good soil," as in the parable of the seed and the sower.

The Favorable Soil

What the seed is in tuberculosis we have already learned: it is the tubercle bacillus. How it is obtained, we also know: it comes from the sputum of an individual suffering from the disease. We have now to consider the *favorable soil* and how it is produced, or, in other words, what influences or conditions render one receptive to the tubercle bacillus. Although we cannot say in any individual case what especial unfavorable condition may render him receptive, for we have no means of measuring the subtile something which we call one's resistance to disease, still observa-

tion and experience have taught us in a general way under what conditions this receptive state to tuberculosis is most likely to occur. In studying many cases of tuberculosis, certain influences in the previous or present life of the consumptive, or in his surroundings, have been so frequently found to be present, that we can infer with a great probability of truth that these influences must have been important factors in preparing the favorable soil and in rendering the individual susceptible to the infecting germ, the tubercle bacillus.

In general, we have found that anything which impairs the general health of a person may be a predisposing cause to tuberculosis. In the first place, certain diseases from which the patient has previously suffered appear to be predisposing causes. Such are whooping cough, bronchitis, influenza, popularly known as the "grippe," measles, and, to a less extent, scarlet fever, typhoid fever, pleurisy, diabetes, syphilis and, perhaps, others. It must be said, however, in this connection, that probably in some cases where these diseases have occurred, the tuberculosis was already present in a latent condition, and the disease rendered it active.

This seems to be especially the case with influenza. The practical lesson to be drawn from this is that especial attention should be given to those convalescing from the acute diseases mentioned above, so that a thorough recovery may ensue and one's normal resisting power be established as soon as possible, and that one should avoid close association with those suffering from influenza or a "cold."

In children enlarged tonsils and the growth in the back of the nose called "adenoids" afford a favorable local soil for the tubercle bacilli, and they have been found in these places. Moreover, the "adenoids" by obstructing the nose, and the tonsils by narrowing the passage into the lungs render respiration inadequate, and in consequence the chest fails of its full development. The whole body suffers from the defective aëration and becomes less resistant to the tuberculosis infection. This subject will be again referred to when speaking of tuberculosis and the child.

The "Neglected Cold"

The so-called "neglected cold" is often adduced as a frequent exciting cause of pulmonary tuberculosis, and when one considers the enormous frequency of colds in northern

climates during the winter season, such would seem to be the fact. In 2700 supposedly well men examined by the writer 41.4 per cent. complained of colds in the head or throat. It is undoubtedly true that what is often called a " cold " is the real beginning of tuberculosis: one begins to cough from the irritation caused by tuberculosis, and therefore he thinks, quite naturally, that " it is a cold." Nevertheless, a simple cold neglected may open the door for the tubercle bacillus to enter. Modern bacteriological studies have taught us that all colds or catarrhs are caused by infection by some germ or combination of germs; but " cold " germs, like tuberculosis germs, must have a suitable soil, an exciting cause. What are some of these causes? Impure air, dust, extreme and sudden alterations of temperature, excessive indoor temperature, dry heat, lack of physical exercise, and inadequate respiration, neglect of daily cold bathing of the throat and chest, an excessive amount of clothing, insufficient sleep and rest, mouth breathing, excess in eating and drinking, constipation. These neglected colds or frequently recurring catarrhal affections " may form predisposing causes," says Dr. Webber, " either by producing sore places in the lining

membrane of the respiratory tract, called the mucous membrane, and thus allowing the bacilli to settle, or by weakening the cells of this mucous membrane and their ciliary (protective) action,"—for these *ciliæ* are tiny, hair-like bodies, constantly in motion, and like a street sweeper, constantly sweeping out all impurities from the respiratory passages,—" or by causing imperfect breathing from unconsciously avoiding deep inspiration in order to avoid coughing, or by weakening the nutrition and energy of the whole system."

Overcrowding as a Cause of Tuberculosis

All the innumerable evils of unsanitary living, which depress one's vitality, are obviously potent influences in preparing the favorable soil for the tubercle bacillus. Overcrowding, as in the tenements of the poor in large cities, is everywhere recognized as one of the great predisposing causes. Thus, in Paris, where so much pulmonary tuberculosis exists and where more than three-fourths of all the families live in three rooms or less, it has been found that the number of cases of tuberculosis increases as the number of rooms in a tenement decreases. In London, statistics show

that the death rate from tuberculosis varies according to the number of persons in a room. In the famous so-called "lung block" in New York City, a great block of the worst kind of tenements, densely inhabited, very many cases of tuberculosis were found to exist. In asylums, prisons, and other institutions where large numbers of human beings are kept in close contact, pulmonary tuberculosis was frequently the most common disease among the inmates, and sometimes produced an almost epidemic mortality. In recent years especial provision has been made in many asylums and prisons for removing the consumptive inmates and placing them under open-air conditions of living in much the same way as in a sanatorium. Of course, overcrowding acts in two ways; greater opportunities of contracting the disease are afforded, for there are quite sure to be some consumptives present, and at the same time the health of all is impaired by the unwholesome conditions incident to the overcrowding.

Whenever, in the remote past, tuberculosis first originated, it was probably coincident with the concentration of human beings in

small areas, crowding together, and with the building of closed places of abode, for, as we have seen, it is, for the most part, a disease of indoor life, a "house disease." In the evolution of civilization, we have reversed the natural order of things, and instead of regarding indoor life the exception, we have made it the rule; and in northern latitudes we spend the greater part of the twenty-four hours under artificial conditions, where we breathe air as devoid of moisture as the Desert of Sahara, and heated to a temperature of 70° or more. Such hot, dry air impairs the protective apparatus of the upper respiratory tract, and bacteria can gain a more ready entrance. We have become so accustomed to this abnormal, constant indoor life, that its dangers are lost sight of, but they are none the less real, and especially menace those of deficient vitality, and gradually lower one's resisting power to disease.

Fresh Air and Sunshine

Absence of fresh air and sunshine is another powerful predisposing cause; and this is a condition not always confined to the tenement houses of the poor, but also not infre-

quently existent in the apartments of the well-to-do. In the tenements of New York City there were found to be 350,000 dark interior rooms with no windows admitting fresh air and sunshine. Fresh air is as necessary as food. Indeed, it is food for the blood, which is the elaborated food of the body. Fresh air stimulates and maintains in a vigorous state the lung tissue itself. If impure, dirty air was as visible as dirty water, we should be less ready to bathe our lungs in it, in our houses and in public places and in vehicles; and we should to a far greater degree recognize its dangers.

Sunshine is equally necessary for a healthful existence, and without it one becomes sickly and pale like a plant in a cellar. An instance is related of a family, consisting of a man, his wife and five children, previously perfectly healthy, who moved to Paris from the country and lived in a cellar. The children and mother died quickly of tuberculosis, which first attacked the children: the father, who worked in the open air, alone escaped. "Where sunlight enters not, there the physician goes," says the old proverb. Sunshine will destroy the tubercle bacilli in a short time.

Sunshine brings cheerfulness of spirits and invigorates the body, and its beneficent influence is probably far greater than we can as yet estimate. At Rollier's sanatorium in Leysin, Switzerland, children with bone, joint and gland tuberculosis are exposed naked for hours to the direct rays of the sun, and with remarkably beneficial results.

Dr. Trudeau's famous experiment with the rabbits well illustrates the evil effects of the absence of fresh air and sunshine. He inoculated a number of rabbits with equal doses of tubercle bacilli, and then he allowed half of them to run free in the fresh air and sunlight, while the other half were confined in a dark cellar where the sunlight and fresh air were excluded. Both sets of rabbits were killed at the same time; those which had been allowed to run free had recovered or showed only slight disease, while those which were confined in the dark place had extensive tuberculosis.

A member of Nansen's Arctic expedition thus describes the alternate influence of darkness and sunlight upon the mind and body. He says: "The last winter in the ice was simply awful. We had our fill of the darkness. We got sleepy and indifferent, and shaky on our legs. We were not ill, but weak

and dead beat, and the doctor was anxious about our brains. When the day came, with the sun, it was like a resurrection for us all. We were electrified when we saw him. Nobody knows how fine the sun looks but those who have been six months in darkness. Then we came to strength again."

So long as modern civilization and industrialism require such constant and almost complete indoor existence, great care should be taken that the fresh air and sunshine have abundant access to the house, factory, workshop, and store. How many a poor clerk, bookkeeper, or shop girl in a department store has been and is preparing a favorable soil for the tubercle bacillus, by being confined in some dark corner in the basement or elsewhere where the sun never enters and the contaminated, foul air is never changed by proper ventilation! Even the well-to-do, who can command the situation, too often forgets the invigorating influences of fresh air and sunshine. "He deliberately turns his back upon the light of the sun," says Mr. Edward Carpenter in his "Civilization—its Cause and Cure," "and hides himself away in boxes with breathing holes (which he calls houses), living ever more and more in darkness and asphyxia, and only coming forth perhaps once

a day to blink at the bright god, or to run back again at the first breath of the free wind for fear of catching cold!"

Evils of Inadequate Respiration

Inadequate and partial respiration is, in the writer's opinion and experience, a frequent predisposing cause of tuberculosis, and, in our sedentary life, is a very common condition. Not only is the resisting power of the lung tissue itself diminished, but the aëration of the blood, upon which depend so largely all the vital processes, is imperfectly performed. Full and free breathing strengthens the pulmonary tissue, increases its vitality and consequently its power of resistance to disease. In his original state good breathing came naturally to man, for he was intended to be an active animal—to run and climb, to bend and twist his body, to stretch and extend his arms, and, in brief, use all his muscles, and as long as he followed Nature in this respect, his lungs had full play and the respiratory muscles were maintained in a state of efficiency. So-called civilization, or, at least, city civilization, has so modified all this, that one's life, in a large number of occupations, has

resolved itself into a mental hunt for subsistance rather than an active bodily one. The natural life, with its bodily activity, has become an artificial one of more or less bodily immobility, and what Nature unconsciously did to promote and maintain proper breathing must now be done by conscious effort and artificial methods, such as gymnastics and athletic exercises and training.

True, a person might perhaps live in comfortable health in this inactive condition, only half-filling and using his lungs, if he were always sure of remaining in it, but he never knows when an emergency may arise which will require the respiration which well-trained lungs can only give, be it running for the doctor in a case of life or death, swimming to save himself in a shipwreck, or exposure to the tubercle bacillus when, in addition, the nutrition happens to be poor or the system depressed. And, further, the sense of physical well-being is much greater when the respiratory tide is full and strong, as the experience of all of us can testify after some exercise which makes large demands upon the "wind," such as running, a game of tennis, or swimming. As some one has well said, "To

breathe well means to live well, to live longer and to live better."

Value of Proper Food

Insufficient and improperly prepared food is, again, a recognized predisposing cause of tuberculosis, and it requires no argument to establish this fact. It is, however, less obvious that food, in order to nourish the body properly and enable it to maintain its working and resisting efficiency, must consist of the proper ingredients and in proper proportions. We must have, in the first place, the proteids, the most important variety of food, which are tissue-builders and repairers of the body, and which are furnished by both the animal and vegetable kingdoms, examples of which are meats of various kinds, milk, cheese, peas, beans, etc. Secondly, we must have the carbohydrates, which supply heat and energy, and are usually of vegetable origin, such as starches, sugar, cereals, bread, potatoes, etc.; and, thirdly, fats, which also supply heat as well as fat—indeed, they are the most important heat producers. The Esquimaux, who require a large amount of body heat to withstand the cold of their Arctic climate, are large

consumers of fats. Fats are obtained both from animal and vegetable sources, such as the fat of meat, cream, butter, olive, and other vegetable oils. It has been found by universal experience that a mixed diet of meat, bread, milk, eggs, vegetables containing fat and sugar in some form, will best furnish these essential principles.

It is well to bear in mind that food must not only be nourishing, but be prepared in a palatable and digestible form: hence the importance of good cooking. Dettweiler, the head of a famous sanatorium in Germany, used to say that his pharmacy was his kitchen, so important did he consider the food and its preparation in the treatment of his patients.

Defective Teeth

Defective teeth are a very real predisposing cause of tuberculosis; for diseased teeth in themselves, as some one has aptly said, "become human culture tubes with ideal culture mediums for the germs of disease"; they also interfere with nutrition through incomplete mastication. When nutrition fails, the body's resistance to disease is reduced. "Defective teeth," says Dr. Osler, "cause

more physical deterioration than does alcohol"; and Professor Jessen of Strassburg declares that "the tuberculosis question, in addition to unhygienic dwellings, insufficient supply of air and light, is a question of nutrition, and, therefore, a healthy mouth is an essential first condition." The practical deduction from this is that the mouth and teeth should be kept in good condition, and the food thoroughly masticated as the first and perhaps most important step in digestion. Good digestion means good resistance to disease.

Alcohol Makes the Bed of Tuberculosis

Excesses of all kinds, particularly in the use of alcohol, lower the vitality and prepare the favorable soil for tuberculosis. The French physicians attribute the great prevalence of tuberculosis in that country to two principal causes, overcrowding and the abuse of alcohol. Professor Landouzy says that "alcohol makes the bed of tuberculosis"; and another French professor, Brouardel, declares that "alcoholism is, in fact, the most powerful factor in the propagation of tuberculosis. The most vigorous man, who becomes alcoholic, is without resistance before

it." In the case of two hundred and thirty-two consumptives under the writer's observation, 41 per cent. gave a history of the excessive use of alcohol. Dr. Newsholme, of England, who has made a very exhaustive investigation of the causes of tuberculosis, says that it is fairly clear that there is an excessive death rate from consumption among intemperate persons. Physicians have long recognized the fact that those who use alcohol, even moderately, have less resistance to infectious diseases; and in the modern treatment of tuberculosis, alcohol finds very little place.

Injurious Occupations

There are certain occupations which seem particularly prone to predispose those who follow them, to tuberculosis; this they do probably both by their influence upon the lung tissue itself as well as upon the general health. Those employed where there is much dust, such as stone-cutters, knife-grinders, potters, dyers, wool-carders, cigarmakers, polishers, and the like, especially where the work is carried on in confined spaces, have always suffered a large mortality from tuberculosis. It has been calculated that forty thousand or

more deaths occurred annually in England and Wales among those thus employed. Mr. Hoffman, the statistician of the Prudential Life Insurance Company, in an analysis of 22,987 deaths from all causes in those engaged in dusty occupations, found that the proportionate mortality from consumption was 28.0 per cent. of the mortality from all causes at ages fifteen and over, while among men in agricultural, transportation, and other outdoor occupations, the consumption death rate was only 9.5 per cent. of the mortality from all causes. "If," he says, "the consumption mortality in dusty trades could be reduced to the corresponding proportion for men in outdoor occupations," which he believes is possible, "a very large number of lives would be saved and continue for many years, which are now, to a large extent, needlessly wasted." Printers, compositors, dressmakers, bakers, and those who work where smoke and irritating gases are generated contract tuberculosis readily. Teamsters and hack-drivers are also frequent sufferers from tuberculosis in spite of their outdoor life, probably from their irregularity of living and alcoholism, for it has

been observed that employments which are associated with temptations to the abuse of alcohol have a high death rate from consumption.

In certain factories and workshops where the employees are crowded together in a confined atmosphere and when there is an absence of sufficient light, tuberculosis is frequent. Probably two causes are at work under these conditions: In the first place, the vitality is lowered by the existing unwholesome influences in such workshops, and thus the suitable soil is prepared; and, secondly, there is always the danger that some workman may be tuberculous and infect his fellow-workmen if he is not careful to destroy or safely dispose of his sputum,—the seed is present. The following case illustrates this danger: In a small and ill-ventilated portion of a counting-house containing twenty-two employees there came two tuberculous persons, coughing and expectorating often upon the floor. The employees came early in the morning to work, when the air of the place was filled with dust from the daily sweeping. Within five years thirteen of these employees died of tuberculosis.

Over-Fatigue and Over-Exertion

Over-fatigue, overwork, and over-exertion, as well as insufficient rest and sleep, again lower one's resisting power to disease and help prepare the suitable soil. "To my mind," says Dr. Burton-Fanning, "there are few causes more powerful to determine the outbreak of pulmonary tuberculosis than *physical over-exertion.*" "I have been struck," he continues, "by the frequency with which consumption attacks men who have distinguished themselves in various athletic pursuits. This remark particularly applies to such sports as tax the power of endurance, such as long-distance bicycle riding or running, rowing, or, in fact, any exhausting exercise. It is important to recognize that, although such exercise be taken in the open air, it is conducive to the development of consumption if it entail exhaustion or fatigue. Still more is this the case if the exertion be undertaken in vitiated atmospheres, and the debilitating effects of impure air be added to that of strain. Many consumptives bring on their diseases by persistent neglect of rest, by working too hard during the day perhaps and taking it out of themselves with pleasure in the evenings."

A case illustrative of the above recently occurred in the author's experience: A young man living under exceptionally good hygienic conditions developed tuberculosis; in seeking the predisposing cause, it was found that besides doing an exacting day's work, he was obliged to make a considerable journey twice daily to and from his work, and thus, as he confessed, he was in a constant state of overfatigue.

Worry

Worry is still another predisposing cause, for it depresses the nervous system, which interferes with the healthy normal functions of the body, and this reduces its power of resistance. In the treatment of the disease in sanatoriums, it has been found that patients fail to improve or retrograde if their minds are not at ease, and they worry over the family left at home or some other real or imaginary trouble. Contentment of mind is an essential condition for the maintenance of a good bodily condition. The man who worries or whose mind is overburdened with care is preparing a fruitful soil for the tubercle bacillus, like Cassius of the "lean and hungry look," who

"thinks too much," who "loves no plays," and "hears no music," who "seldom smiles," and "scorns the spirit that could be moved to smile at anything." He is in a receptive condition either for an invading infectious germ, or a great tragedy, as in the case of the ill-starred Cassius. Peace of mind and contentment are as essential for the body as the spirit. "A merry heart doeth good like a medicine: but a broken spirit drieth the bones."

Monotony of Occupation

Monotony of life exercises a depressing influence upon the body, and therefore acts as a predisposing cause to tuberculosis. In the industrialism of the present day when the workman or operative performs a single act over and over again in the manufacture of any article, the monotony of it becomes depressing. So with the housewife whose daily round of household duties is ever the same and never done. To obviate the evil and depressing influence of such monotonous occupations, diversion and amusement must be afforded, so that one may forget for an hour that he is a cog in the wheel of the great

machine, and thus refreshed in mind he can return to his labor with renewed vigor to endure the monotonous round of his existence. To provide clean amusement for the people is an hygienic measure of the first importance. To have a healthy body we must have a healthy mind.

Tuberculosis has been well called the "disease of the masses," for it thrives upon human misery and poverty. The tenement house with all its evils of overcrowding; want; excessive hours of labor; absence of fresh air and sunlight; alcohol, often, alas! the only solace and diversion of the poor man, vie with each other in preparing a fertile soil for the deadly tubercle bacillus. Any and every measure which makes for the improved living conditions of the masses is a redoubtable foe to all these many predisposing influences. We must render the soil sterile as well as control the seed.

VI. THE RECOGNITION AND SYMPTOMS OF TUBERCULOSIS

SINCE the discovery of the cause of tuberculosis, the study of the disease has been renewed with great vigor and interest. Particularly is this the case in the endeavor to discover it at an early stage, when it is just beginning, and when it can be treated with the greatest probability of success. In earlier times tuberculosis was not generally detected until it had made considerable progress and was in what we should now call a more or less advanced stage, and when it had seriously affected the general health. By a careful study of the symptoms and by improved methods and greater skill in physical examination, the physician can generally recognize the disease at an early period. Unfortunately, however, many persons suffering from it are all unconscious of the fact and do not seek the physician until the disease is advanced and the most favorable time for

treatment has passed. Hence the great importance of seeking an examination if some or any of the suspicious symptoms are present which one can easily detect, and which suggest the possibility of tuberculosis.

Early Symptoms

Such symptoms are a slight hacking cough, perhaps only occurring in the morning, and which persists, accompanied with a slight amount of expectoration,—one often deceives himself by regarding such a cough as only a slight "cold,"—a loss of weight and strength, and a general feeling of debility so that one does not feel "up" to his work; a loss or impairment of the appetite; slight fever in the afternoon, perhaps preceded by chilly sensations; breathlessness on exertion; and sometimes "night sweats." In the past many cases of consumption were mistaken for malaria, bronchitis, the "grippe," or only dyspepsia, and so went on in a false security until finally the sad awakening came and the disease was found to be advanced. Bleeding from the lungs, which is called "hæmoptysis," may be the first symptom which calls attention to tuberculosis; and it is sometimes fortunate

that this symptom which, in the early stage, is not so serious as alarming, occurs in the beginning of the disease, for the patient in his alarm hurries to the physician, and thus the disease is discovered at an early period and timely treatment begun.

It is interesting to know how the physician goes to work to make what is called a "physical examination" of the lungs. He first begins by "inspection," looking at the bare chest of the patient and observing its shape, irregularities, and its movements in breathing. Sometimes one side of the chest will have less movement in respiration than the other, which suggests that on the side of less movement there may be some tuberculous deposits which restrict the respiratory movement. Again, the physician may notice that there is a slight depression at the top or apex of one side of the chest, which again suggests tuberculosis. After obtaining all the information he can by inspection, the physician next proceeds to employ the two most valuable methods of physical examination, called "percussion" and "ausculation," which depend upon the resonant quality of the lungs, and the

sounds which are produced in them by the act of breathing, or talking.

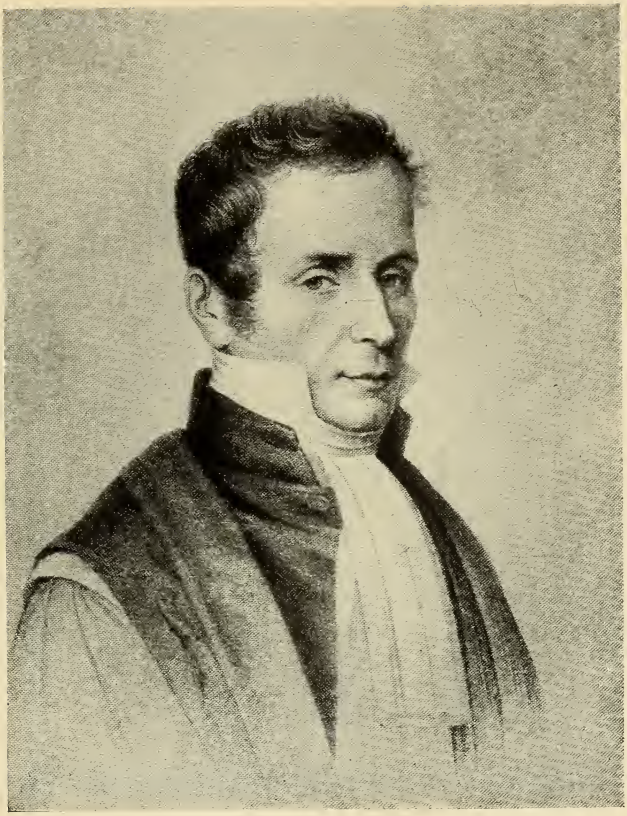
How the Lungs Are Tested

The method of "percussion" or tapping with the finger or an instrument, like a little hammer, upon the chest wall, sometimes called "sounding" the chest, was discovered long ago by a Viennese physician named Auenbrugger, who published his discovery in 1761 in a little book written in Latin, entitled the "New Invention." In the preface he says: "I present to you, charitable reader, a new sign which I have discovered for detecting diseases of the chest. This consists in the percussion of the human thorax, from the varying resonance of the sounds of which an opinion can be formed of the internal condition of this cavity." For forty-seven years this inestimable discovery of Auenbrugger seems to have been lost sight of, when Corvisart, a Frenchman, who was the physician of Napoleon, rediscovered it and translated Auenbrugger's little book into French in 1808. From that time to the present percussion has been in constant use by physicians, and will always

remain a method of the greatest value in examining the chest.

"Auscultation," "that wonderful art of discovery of disease," says Dr. Oliver Wendell Holmes, "which, as it were, puts a window in the breast through which the vital organs can be seen to all intents and purposes," was discovered by a French physician, Laennec, who published a treatise upon it in 1819. "Before Laennec," says some one, "clinical observation, though never blind, had been always deaf." By auscultation we are enabled to listen to the sounds of breathing and the voice sounds as they are re-echoed in the chest, and also to detect other abnormal sounds which disease causes in the lungs. When one is familiar with the normal sounds of breathing and of the voice, he is enabled to determine when these sounds are changed by disease or when other sounds not present in health occur. Thus, the physician can by experience tell the peculiar sounds, and modifications of the normal sounds, which are produced when there are tuberculous masses in the lungs, if these masses are large enough to affect the normal sounds.

In practicing auscultation an instrument



THÉOPHILE LAËNNEC,
Discoverer of Auscultation.

called the stethoscope is employed, one end of which is applied to the patient's chest and the other to the physician's ears. Laennec, who made the first stethoscope, which was simply a hollow wooden cylinder a foot long, thus happened upon this invaluable discovery: He was one day consulted by a stout young woman with symptoms of heart disease. On account of her stoutness and her age and sex, he was prohibited, he says, from applying his ear directly to her chest. Taking up a quire of paper from his desk, he made a tight roll and applied one end of it to the chest of the young girl and the other to his ear. With delight he found that in this way he perceived much more plainly the beating of the heart.

"What millions of physicians," says a writer upon Laennec, "must have attended millions upon millions of chest disease between Hippocrates and Laennec, and yet Laennec was the man and mind wanted to make, or rather to complete, a discovery that had been lying ready for birth some thousands of years. It waited for the fat young lady with heart disease whose chest could not be touched by ears polite, for the quire of paper that ad-

mitted of being rolled into a tube for listening through, and for this man Laennec to do the part of thoracic eavesdropper."

It seems the irony of fate that Laennec, who devoted his life and genius to the study and detection of tuberculosis, should have himself died of this disease at the age of forty-five; but his work lives after him, and every time the physician uses the invaluable method of auscultation and applies his stethoscope to the patient's chest he thinks with gratitude of this renowned Frenchman who, for the good of humanity, placed this means of examination in his hands.

It requires a keen ear and one accustomed to detect slight variations in the pitch and tone of sounds to be successful in percussion and auscultation, and it is not surprising to learn that both Auenbrugger and Laennec were lovers of music. Indeed, Laennec was a musician and played upon the flute, while Auenbrugger attuned his ear by listening to good music. Of all the methods of physical examination of one suspected of having tuberculosis, percussion and auscultation are the most valuable, for they "enable us in many cases," as Dr. Holmes so wisely says, "to distinguish

phthisis (tuberculosis) before its existence is shown by the general symptoms, at a period when we can say, do this and you may live, do that and you must die." Not infrequently, however, we are unable to determine the existence of tuberculosis by the most painstaking physical examination; but our resources are not yet at an end. We have other valuable aids.

Examination of the Sputum

The first is one which is always employed by physicians when possible, that is, when any expectoration can be obtained, which is not always the case in the very early stage of the disease: it is the examination of the sputum, to see if there are the germs of tuberculosis, the tubercle bacilli, in it. By means of certain staining fluids we can color the tubercle bacilli, which will retain the stain when it is washed away from the other portion of the sputum. When the sputum is so prepared and placed under the microscope, the bacilli, if they are present, are seen as tiny red rods. So characteristic are they that when once accustomed to their appearance, they cannot be mistaken.

When the bacilli, or tuberculosis germs, are found in the sputum, it is a sure proof that tuberculosis exists; but not infrequently, in the very beginning of the disease, and also when it is more advanced in certain cases, the germs are, for one reason or another, not found, so that we are not justified in saying that there is no tuberculosis when this is the case if there are other symptoms and signs of the disease. We must then turn to other tests. So important, however, is the examination of the sputum, which, when successful, or "positive," as we say, is an absolute proof of tuberculosis, that state and city boards of health now maintain free laboratories to which physicians can send the sputum of a suspected case of tuberculosis and have it examined by an expert. All medical students also are now taught to make the sputum examination for tuberculosis in the interest of their future patients.

The Tuberculin Test

Another modern aid is the "tuberculin test." We have already spoken of tuberculin in the previous chapter, and it is this same tuberculin which is employed in making the tuberculin test. A very minute quantity is either in-

jected into the suspected individual, or he is vaccinated with it much as we vaccinate for small-pox, or a drop of a very dilute solution is put in the eye. If tuberculosis exists anywhere in the body, we generally obtain a "reaction," as it is called, in the case of an injection; or, if used by vaccination or in the eye, certain characteristic appearances are observed. This test is not always sure, but it is a very great aid in detecting early tuberculosis. Long and large experience with the use of tuberculin in this way has proved that it is not injurious if carefully applied by the physician.

The tuberculin test is also used with great success in the testing of cattle, especially cows, and is now generally employed with dairy herds in order to safeguard the milk.

So the world is not only indebted to Professor Koch for the discovery of the cause of tuberculosis, but for this very valuable aid in detecting it at an early period.

The X-Ray

Still another aid in the detection of tuberculosis is the X-Ray, now so generally known and used, particularly by surgeons. By means

of this wonderfully penetrating light we can actually look through the body, and it becomes almost as transparent as was Marley's ghost when old Scrooge, in Dickens' "Christmas Carol," looked through it as it stood in his bed chamber and saw the two buttons on its coat behind. The lungs in health are quite translucent to the X-Ray light, but when there is tuberculosis in them, a dark shadow appears, the tuberculosis deposit prevents the light from penetrating them. So by the X-Ray picture we can often detect evidences of tuberculosis which cannot be discovered by the other methods of examination.

By having at our command all these various methods of examination and by carefully taking into account all the symptoms, we are enabled almost always to recognize pulmonary tuberculosis in its commencement or at least strongly suspect it and so begin the treatment when there is every hope of cure. With children the detection of tuberculosis is generally more difficult than with adults, for among other difficulties, they do not expectorate and we cannot have the help which the sputum examination affords. With all the methods of examination, however, and the skill of the phy-

sician, the disease is more frequently discovered in children than formerly, and it has been shown that it is far more prevalent in them than was previously supposed.

Closed Tuberculosis

It has been said above that sometimes in the beginning of tuberculosis the germs are not found in the sputum, and it is also true that in some of these early cases there is no sputum. We call such cases "closed" tuberculosis. If, therefore, we can detect, treat and cure these "closed" cases before they become "open," or have sputum containing germs, we protect the community by just so much from the dangers of contracting the disease. For such cases, if they were allowed to go on and become "open," or communicable, and if they did not properly destroy their sputum, would give the disease, it is estimated, to three times as many more on an average.

The Only Safe Way

In the very beginning of tuberculosis, there are frequently few, if any, symptoms, and the individual does not feel really ill. How, then,

is he to know that he is in any danger, and seek an examination of his lungs? The only safe way is occasionally to have one's lungs examined, particularly if there has been any exposure to the disease, as in a family where some member is suffering from it. School children and students should be periodically examined, particularly on graduation from school or college, for if any evidence of tuberculosis was shown, advice with regard to the choice of an occupation would be of inestimable value. How many young lives just beginning their career might have been saved from an untimely ending through tuberculosis if this plan had been followed!

In the same way, if all operatives in workshops and factories, employees in department stores and clerks could receive a periodic examination of their lungs, many lives would be saved, and those associated with them would be protected from the possibilities of contracting the disease. When we remember that from one-fourth to one-third of all deaths between the ages of fifteen and forty-five or fifty years are caused by tuberculosis, there is the very greatest reason why all persons during this age should from time to time have

their lungs examined. If such a mortality as now occurs from tuberculosis was known to exist from a single disease among a choice breed of cattle, horses, sheep, or what not, how quickly would the owners use every protective means to safeguard their stock. "How much then is a man better than a sheep"!

There are many difficulties in discovering tuberculosis at an early period among wage-earners and the poor. In the first place, the workingman cannot afford to give up his work until actually disabled; and, again, he is often ignorant of the meaning of his symptoms, or, if he does suspect that he has tuberculosis, he fears that its discovery may lead to the loss of his occupation and hence the livelihood of himself and family. Finally, if he has to pay for his examination, he may not have the means to do this.

To obviate this, there are now established all over the civilized world—and their number is being daily increased—free tuberculosis dispensaries where a reliable examination of the lungs can be obtained without expense to the poor man. These beneficent institutions in connection with the popular dissemination of the simple truths concerning tuberculosis are

of the highest value in securing to the workingman an early examination of his lungs.

In connection with such dispensaries there are trained nurses, social workers, or visitors who visit every home where a case of tuberculosis is found to exist, and who, besides advising the consumptive member how to properly conduct his life so as to avail himself of all his chances of recovery, if he is treated at home, urges all the other members of the household to go to the dispensary for an examination. In this way, many early cases of tuberculosis are discovered and thus we are enabled, as Dr. Pryor has so well and epigrammatically said, "to care for the consumptive in the right place, in the right way, and at the right time until he is cured; instead of in the wrong place, in the wrong way, at the wrong time until he is dead."

Points to Remember

Consumption is curable in the larger number of cases if treated at an early stage. Hence, an early detection of the disease is of the very greatest importance; and among the earlier symptoms which anyone can observe

(and, finding which, he should at once seek the physician) are:

(a) A slight cough, or a cold, lasting a month or more.

(b) Loss of weight.

(c) Slight fever in the afternoon.

(d) Loss of strength, or a tired feeling.

(e) Shortness of breath on exertion.

(f) Loss or impairment of appetite.

(g) Bleeding from the lungs.

A wise English physician gives this advice to doctors: "Always say three things to a patient whom you suspect to be phthisical (tuberculosis):

"(1) 'Get yourself weighed—by the same machine each time—to see if you are losing weight.'

(2) 'Use a thermometer two or three times each evening, to see if there is any fever.'

(3) 'Save your sputa to be tested (for bacilli).'"

VII. THE CURABILITY OF TUBERCULOSIS AND ITS TREATMENT

A GREAT change has taken place in recent times in the opinion both of physicians and the public regarding the curability of tuberculosis. As was stated in the conclusion of the last chapter, tuberculosis is now regarded as one of the most curable of chronic diseases, provided the treatment is begun early, before the disease has made any serious inroads upon the general health and constitution. Experience, that infallible teacher, extending over many years, has abundantly verified this statement.

Formerly Regarded as Hopeless

Formerly, however, tuberculosis was considered well-nigh hopeless by the majority of physicians, principally due to the fact that they did not know how to discover it, as a rule, until it had reached an advanced condition.

Louis, one of the most celebrated French physicians, declared more than eighty years ago that tuberculosis was a well-nigh hopeless disease, and almost invariably terminated fatally; and Dr. Stoll, an old English physician, speaks of an eminent divine who declared that it was blasphemy to assert that the disease (tuberculosis) was curable, "for God himself had made it incurable." Dr. James Jackson, a distinguished physician in Boston in his day, wrote in 1855 that consumption was almost uniformly fatal; and Dr. Wilson Fox of London, as late as 1887, declared that complete cures of consumption was a rare event.

From the time of Hippocrates down the ages, however, there was now and then a keen physician who declared his belief in the curability of tuberculosis. Hippocrates himself believed this. Laennec, of whom we have already heard, declared that the cure of consumption when the lungs are not completely diseased, ought not to be looked upon as at all impossible; and after reviewing the various cures suggested at that time, such as bleeding, blisters, purgatives, the inhalation of different gases, the air of cow houses, acorns roasted

or raw, mushrooms, crabs, oysters, frogs, vipers, emetics, etc., finally concludes with the following wise remark, "that although the cure of consumption may be possible for nature, it is not so for medicine." Would that the last part of this sentence was always kept in mind at the present day, for even now many a poor consumptive believes that medicine or some of the innumerable quack remedies can cure him.

Useless Remedies

Numberless remedies have at one time or another been extolled and applied, often to the injury, if not worse, of the unfortunate consumptive. A hundred years ago, emetics and cathartics were a popular form of treatment of tuberculosis, as of many other diseases.

Dr. Stoll of Hartford, Conn., who has written a very interesting account of the early treatment of consumption, quotes a Dr. Parr as saying, "Could phthisis (consumption) ever be cured it would be by joint action of emetics and blisters"; and there is a record of a woman, aged forty years, who took 600 emetics in ten years. The result of this heroic treatment is not given, but it is not difficult to guess. Bleeding was another popular method

SLEEPING WITH HEADS OUT OF THE WINDOWS.

of treatment, and Dr. Stoll refers to advice given to a consumptive to "lose six ounces of blood each day for a fortnight, if *he lived so long!*" Residence in a cow house was another treatment, founded on the theory that the "vapors" and heat from the cows were somehow beneficial. This form of treatment, however, did not seem to be very kindly received, and a certain physician who was accustomed to advise it, remarks: "Not infrequently did I forfeit the good opinion of my patients." Almost everybody believed night air injurious as well as cold air, and consumptives were advised to shut themselves up in the house during the coldest months of the winter. The two striking features in the treatment of the disease during the last century were the removal of the patient to a milder climate, no matter what the stage of the disease, and the use of cod liver oil. Multitudes were sent away to die far from home, and the nauseous oil destroyed the digestion of not a few.

The True Theory of Treatment

Here and there, however, as has been said, there were a few wise physicians who believed

that consumption was at least sometimes curable and were sagacious enough to recognize that the essential treatment was not by drugs and depressing measures, but by supporting the patient and increasing his resisting powers. Thus, in 1804, there was a Dr. Stewart of England, who was both a clergyman and physician, whose treatment "was founded," as one of his patients expressed it, "upon every principle of common sense," and who "supported the constitution and enabled it to throw off the disease by its own rallying powers." In 1840 George Bodington, a country doctor in England, presented a method of treatment to his medical brethren which he called, "The cure of pulmonary consumption on principles natural, rational and successful," and established a sanatorium in which he carried out his treatment, which was essentially the "open-air method" of to-day. The public, however, was not ready for such a radical innovation upon the old-established drugging method, and bitterly opposed him, as did his own professional colleagues. His patients forsook him and he was finally obliged to turn his institution into an insane asylum, and he, indeed, was regarded as a lunatic. In 1855

Dr. Henry McCormac, of Belfast, Ireland, wrote a book in which he advocated a similar method of treatment to that of Bodington's; but he, also, met the fate of his predecessor, and was bitterly opposed and even persecuted. Such is so often the experience of those who present some new discovery or device which is contrary to the accepted opinions of the times; they find but few daring spirits who are willing to investigate with open mind the new ideas, and who are ready to accept them if they offer something better than what exists. Such has often been the case within the medical profession itself.

Finally Brehmer, a German pioneer in the modern treatment of tuberculosis, established in Goerbersdorf, Germany, the first sanatorium, fifty or more years ago, conducted upon the modern principles of the out-door treatment, and which is still in operation.

Gradually at first, and later more rapidly, similar sanatoria have sprung up in almost every civilized country, until now the new idea of treatment has become thoroughly established.

After the cause of tuberculosis had been proved to be a specific germ—the tubercle ba-

cillus—there was a new search begun to find a specific remedy which would destroy this germ in the lungs and so stop the disease. It seems to be an instinct in human nature to be ever seeking a specific remedy, an easy cure, for the diseases of mankind; to swallow a drug seems to so many persons a much more direct and easy method of cure than the slower and more certain process of following Nature's laws and correcting errors in one's mode of life.

At first some substance was sought for which could be injected into the lungs and kill the bacillus, but nothing has ever been discovered which will do this without killing the patient. Again, various antiseptics have been tried, applied in one way or another, by inhalations, vapors, or taken internally, for the same purpose of destroying the bacillus, or preventing its activity, but they likewise have all failed. Still the search goes on and hardly a week passes that some new specific is not extolled as a "sure cure" for consumption, but, like Job's friends, they are all "miserable comforters"; they have their little day, fail, and pass into oblivion.

The only treatment which has stood the

test of time and the one universally employed at the present day is the so-called "open-air treatment." When it is recalled that in former times the unfortunate consumptive was confined in a closed room, so great was the fear of taking more cold (for, because the cough was the most prominent symptom, it was really regarded as the disease itself), it will be realized how radical a change from this old method is the new one of the out-door life.

The Out-Door Treatment

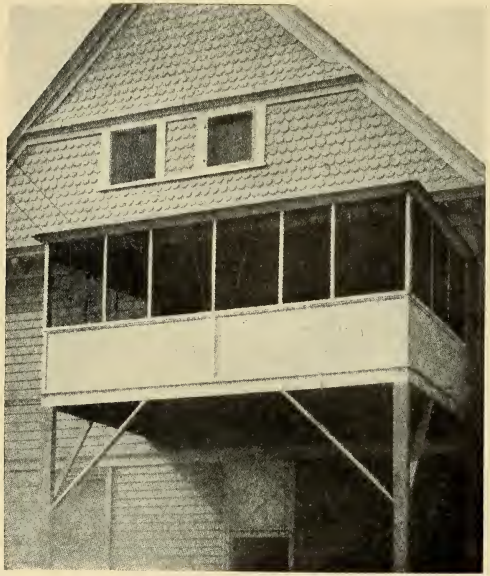
The principle of the "open-air treatment" is simple and consists in re-establishing the power of resistance of the consumptive by increasing his vital powers,—in brief, to produce and maintain a high degree of bodily health. The whole treatment is, in a sense, an indirect one, a treatment of the individual rather than of the disease. As in the case of so many other diseases for which we have no specific remedy, it is simply putting the consumptive in the most favorable condition to fight his own disease; it is developing to the highest degree his "natural immunity," of which we have before spoken. This seems

very plain and easy in the statement, but it really requires much patience and power of will to adhere rigorously to a strict daily routine of living, extending over a considerable period of time, even for years, it may be, in some cases.

There are four essential requisites in this treatment:

(1) Competent and continued medical supervision. The physician must plan, direct and supervise the daily life of the consumptive. No one should undertake the treatment without being in touch with a competent physician.

(2) Continuous out-door life. The constant and continuous exposure of the patient to pure out-door air night and day. During the day the patient remains out-of-doors, either at rest in a reclining chair, like a ship's chair, or, later in the course of the treatment, taking a limited amount of exercise on the advice of the physician only. If there is fever, even a little rise of temperature, absolute rest is required. At night, one either sleeps directly out of doors, as is so frequently done at the present time—and even the well are adopting this wholesome habit—



SLEEPING PORCHES.

or in a large room with wide open windows whatever the weather outside may be. There are also devices, such as window tents, or especially constructed beds, whereby one's head can be out-of-doors while his body is in the room. It used to be thought that night-air was injurious, but we know now that it is as good as day-air, and sometimes better, as in cities, when there is less dust in the air at night on account of the decreased traffic.

(3) Good Food. An abundance of good nourishing food, properly arranged as to quantity, quality, and the digestive powers of the individual, and, which is most essential, properly cooked.

(4) Tranquillity and hopefulness of mind, for the mental condition has much to do with the success of the treatment. An unhappy, discontented patient is less likely to improve in this or any other chronic disease, as has been referred to in the previous chapter. The writer once had a patient who became a Christian Scientist, and it produced such a tranquil, hopeful state of mind in him that, whatever his personal opinion with regard to this pseudo-science may be, it apparently in this case greatly aided in the successful issue.

One might add a fifth essential, so universally is it employed in the treatment, namely, the cold sponge or shower bath in the morning. Of course this is only to be taken under the advice of the physician, for there are certain conditions or symptoms which would render it injurious.

The whole treatment should be most carefully arranged and constantly supervised by the physician, who must in the most painstaking manner personally attend to every detail,—he must provide for every hour in the day, as will be further considered in a subsequent chapter.

The patient must be truthfully told of his condition and its dangers, as well as the hopeful outlook from treatment if he implicitly obeys his physician. It is a mistaken kindness to keep him in ignorance of his true condition; he is sure to discover it later, and then he will lose confidence in his physician. Moreover, if he knows his condition, he will realize more fully the importance of adhering rigorously to the treatment.

From In-Door to Out-Door Life

Consumption, as has been already said, is

a disease of in-doors, a "house disease," and the in-door life must be changed to an out-door one. This is a very radical change, and it requires a little time to become accustomed to it.

One may be apprehensive of taking cold, or fear that he has not sufficient strength to endure the exposure, especially in cold weather. When once, however, the out-door habit is acquired, enthusiasm takes the place of fear; the sense of well-being caused by the stimulating effect of the constant exposure to pure air is so keen, and the evidence of the beneficial effects in the improvement of all the symptoms, particularly the appetite, is so apparent, that one soon acquires a zest for this new mode of existence and wonders how he could have ever been content with his in-door life. "In spite of rain, fog or snow," says Dettweiller, a pioneer in this form of treatment, "in spite of a temperature below zero; very often without sun, the patient spends from seven to ten hours out-of-doors and sometimes even eleven hours. . . ." After a while one acquires such a hunger for fresh out-door air that he feels he cannot live without it.

In sleeping out-of-doors, whether it be in a sleeping porch, on the piazza, or by use of the out-door bed or window tent, one can be made really comfortable by warm garments and bed clothes, a woolen hood for the head, and a soapstone or hot water bottle for the feet; so that he can sleep peacefully even in the winter months of northern latitudes. During the winter of 1903-1904, fifty per cent. of the patients at the Adirondack Cottage Sanatorium slept out-of-doors, not only without injury, but with apparent benefit, though it was one of the coldest winters known there for many years. One surprising fact observed with those taking the open-air treatment is the infrequency of colds,—no one has any fear of a draught, that bugbear of the in-door dweller.

Rest in the Cure

Experience has shown that while taking the "cure," as it is called, a great deal of rest is necessary, particularly in the beginning. This is in accordance with the general law of Nature, that an injured part or diseased organ requires rest for recovery.

After the disease is well on the road to recovery and the temperature is normal, then carefully graded exercise can be begun and

A WINTER'S DAY AT THE SANATORIUM — A SUN BATH.

gradually increased if no injurious effects follow. It has been found that exercise under these conditions increases the "natural immunity" of the body. Formerly the very hazardous advice used to be given to the consumptive to get out-of-doors and exercise; go West and ride horseback on the plains. Sometimes this advice would be followed by success, but more times the poor patient ruined his chances of cure by so doing. Exercise must be as carefully administered and regulated as any other part of the treatment. At the Frimley Sanatorium in England a very carefully arranged series of graduated exercises of various kinds and degrees is employed for suitable patients, constantly supervised by the physician; and the Frimley example has been followed with equal success in other sanatoria. The open-air treatment can be carried out either in a sanatorium, at one's home, or in a health resort which is considered to possess certain climatic excellencies.

The Sanatorium and Its Advantages

Probably the "cure" can be most effectively and successfully conducted for the majority of consumptives in the modern sanatorium, although it must be borne in mind that it can be accomplished anywhere if the system

is rigidly adhered to and tolerably pure air is attainable. In the first place, the sanatorium is built and equipped for the express purpose to which it is devoted, and its physicians are selected for their skill, experience and personal fitness for this especial work. Being constantly upon the ground, they exercise continuous supervision over the patients and encourage them in the prosecution of the cure. For the poor the State Sanatorium offers better opportunities than could be obtained at home; while for the well-to-do the "paying sanatorium," so-called, offers advantages which only with difficulty and greater expense could be secured at home. Indeed, in some homes, the patient could never be controlled sufficiently to successfully make the "cure." Again, by going to the sanatorium, all possibility of infecting other members of the household is avoided, for with the best intentions and the exercise of great precaution, infection may occur through carelessness in disposing of the sputum. This danger is greater obviously in the crowded homes of the poor.

The sanatorium is, again, an excellent training school in the ways of the open-air treatment. Even if the consumptive is subsequently treated at home, a few weeks spent in

a well-conducted sanatorium is the quickest and most effective way to learn the open-air method of treatment; for the patient sees, day after day, how it is done, and he quickly falls into the routine and follows "the lead." The sanatorium patient is made to feel that he is taking advantage of every favorable condition in his case, and all he has to do or think of is to follow out, from day to day and hour to hour, the plan of life arranged for him,—he is freed from all responsiblity in the management of his case, which is a favorable attitude of mind for recovery.

As the cured patients go forth from the sanatorium, they become apostles of the fresh air life and wholesome living in the communities in which they reside. A graduate of one of the State Sanatoria changed his previous in-door occupation to that of a milkman for the sake of the open-air life, and it was soon observed that the windows of the houses on his milk route were more widely and constantly open than in other portions of the town: he had been preaching the gospel of fresh air.

Alleged Objections to the Sanatorium

A frequent objection urged against the san-

atorium is that the influence from the aggregation of so many consumptives is depressing. That fact, however, is quite the reverse, as is attested both by those in charge of them as well as by the inmates. One encourages another, and the improvement observed in one patient inspires another, while the physician in charge, if he possesses the requisite qualifications, encourages and inspires all. Furthermore, the patient's time is so fully occupied in making the "cure" that he has none for depressing introspection. In a private letter written to the director of a sanatorium, a former inmate thus gives his impressions: "A happier set of invalids I never saw. At my table none looked ill, and were as intelligent and refined and jolly a crowd as I have seen all summer. I have visited in my time many hospitals, asylums and homes, but none like this."

Another objection raised is the danger of reinfection,—of getting another dose of germs, where there are so many consumptives in such close intimacy. There is no proof, however, that this happens. Everything in and about the sanatorium is kept scrupulously clean, and the utmost watchfulness is observed in the care of the sputum.

Any inmate found to be careless in this respect is instantly discharged. A director of a sanatorium once told the writer that a successful plan he pursued to prevent any carelessness in spitting among the inmates was to tell each one that he might receive a new infection and thus jeopardize his chance of recovery if anyone else should expectorate upon the floor or ground or anywhere else where it could become dry; therefore he must sharply watch all the others for his own protection. Thus everybody was watching everybody else: the law of self-preservation worked most effectually.

Examination of the dust in various sanatoria and consumptive hospitals has rarely revealed the presence of the tubercle bacilli, and then only when some patient was found to have been careless in the disposal of his sputum. As has elsewhere been mentioned, the sanitary conditions in communities where sanatoria exist have improved, the death rate has fallen, and tuberculosis among the inhabitants has diminished.

No Medicine Used in the Sanatorium

Practically no medicine is employed in the

modern treatment of tuberculosis, except temporarily in the treatment of some symptoms. Even for cough, which is, perhaps, one of the most frequent and constant symptoms, medicines are rarely used, for experience has shown that fresh air is the most efficacious of all remedies. Furthermore, the patient can be trained to suppress all unnecessary coughing —that which is accompanied by no expectoration. Dr. Dettweiller used to tell his patients that they could not come to the public dining table if they coughed, "for," he said, "it is impolite to scratch one's head in public, and equally so to scratch one's throat." A good method of controlling a useless cough is, whenever the inclination to cough is felt, to tightly close the mouth and take several full, slow breaths through the nose; and repeat this until the desire to cough disappears. In the majority of cases, however, the cough will practically cease under the influences of the open-air life.

Seventy Per Cent. Cured or Arrested in the Early Stage

If consumption is discovered in its incipient stage and the open-air treatment immediately

THE "SHACK" FOR OPEN-AIR TREATMENT.

begun, a large experience has proved that 60 or 70 per cent. or even more can be apparently cured or "arrested." As, however, the disease becomes more advanced, this percentage rapidly falls to twenty-five or twelve per cent., until in far-advanced cases no cure or arrest can be expected. How supremely important it is, then, to seize the moment when the disease is at its beginning to commence treatment, knowing that such a large per centage recovers at this early stage, for it cannot be too often repeated that tuberculosis is one of the most curable of all chronic diseases. It is infinitely true of tuberculosis, as of many other things, that "there is a tide in the affairs of men, which taken at the flood, leads on to fortune." Persistence in the treatment, a rigid adherence to the plan arranged by the skilful physician without changing about from one health resort to another or one physician to another, as some do to their grief, is the condition upon which favorable results are to be expected. Eternal vigilance is the price of recovery as of liberty.

VIII. THE HOME TREATMENT OF TUBERCULOSIS

EVEN with the constant increase in the number of sanatoria it is apparent that but a small proportion of consumptives can be accommodated in them, at least in the United States, even if they all desired to be. The vast majority must be treated at home if treated at all. According to Prof. Osler probably not more than five per cent. can take advantage of the sanatorium or of climatic treatment. Fortunately, however, the open-air treatment can be successfully carried out at home, even in the homes of the poor in the city. No consumptive need despair if he is unable to seek a new climate or enter a sanatorium. The general principles of the treatment are, of course, the same, but their application must be modified to suit the varying conditions of the patient and his surroundings. Prof. Osler thus tersely outlines the essentials of the home treatment:

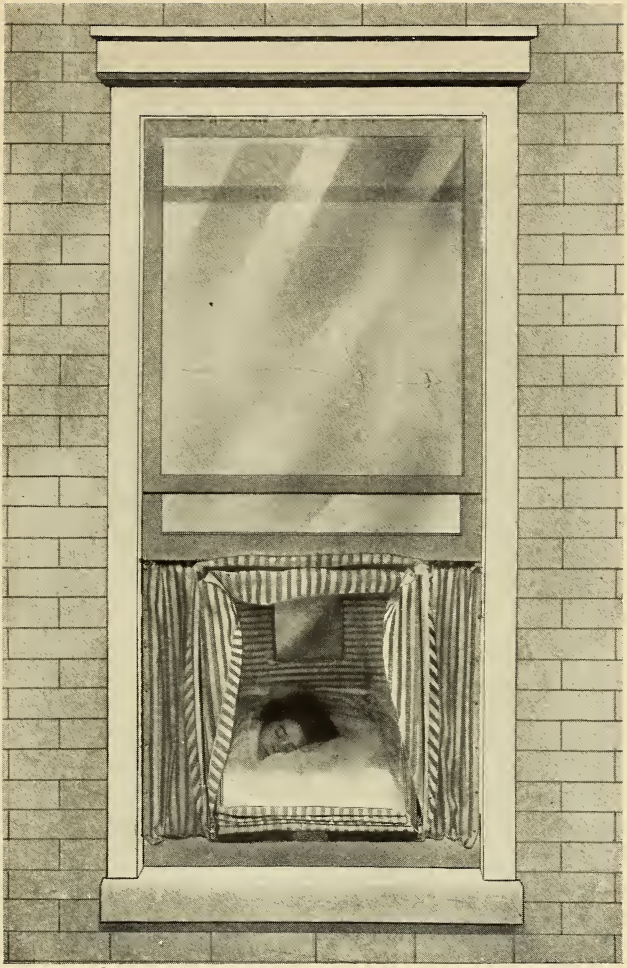
"First, the confidence of the patient, since confidence breeds hope; secondly, a masterful management on the part of the doctor; thirdly, persistence . . . ; fourthly, sunshine by day, fresh air night and day; fifthly, rest while there is fever; sixthly, breadstuffs and milk, meat and eggs." The "masterful management on the part of the doctor" is of paramount importance, for he must arrange the plan to be pursued in all its details.

It is not by any means only the poor who are treated at home. Others in better circumstances may desire, or be compelled from one reason or another, to do so. A residence in the country or suburbs of the city is, of course, to be preferred, for one can obtain purer air and more sunshine, and there are fewer distractions. If the patient is unaccustomed to discipline, or a child, the employment of a nurse experienced in the treatment, at least in the beginning, is of great value. The nurse can more quickly educate the patient in the details of the cure, and if she is agreeable and inspiring, her companionship and encouragement render the routine of the treatment less irksome. It is frequently possible and often wise to send the patient, who is

subsequently to be treated at home, to the sanatorium for a brief period, as has been before mentioned, in order that the general plan of treatment may be more thoroughly and speedily learned.

The Room of the Consumptive

The room occupied by the patient should have a southern, or southwestern exposure, not only on account of the sunshine, but because it will be cooler in summer and warmer in winter. It should be large, with abundant window space, and when possible have an open fireplace. The furnishings should be few and plain, without heavy hangings or upholstery, which collect and hold dust. The floor should be such that it can be easily washed; and everything in and about the room should admit of easy and thorough cleaning. A rug or two may be allowed on the floor. The bed, unless one sleeps in the open, should be placed in such a position as to be continually bathed with fresh air. The bed clothing should consist of woolen blankets or of eider-down material, the latter having the advantage of lightness as well as warmth.



By courtesy Cabinet Mfg. Co.

THE WALSH WINDOW TENT.

For several hours every morning the bed clothes and mattress should be placed in the sunlight and well aired. At frequent intervals the floor, walls and furniture should be cleansed with soap and water or wiped with cloths wet with a solution of chlorinated lime or a weak solution of corrosive sublimate. In some cases, where there is a good deal of coughing and expectoration an occasional disinfection with formaldehyde gas is advised, care being taken that all small articles used by the patient, such as books, cards, baskets, etc., should receive a thorough fumigation. All dusting should be done with a damp cloth.

The windows are to be constantly open, except when dressing and undressing. When in the room and not in bed, the temperature should be from 65° to 68°.

A balcony or sleeping porch connected with the bedroom so that the bed can be rolled out upon it through a low window or door, is a very desirable addition. An adjoining bathroom, which can be warmed, is also desirable for the cold bath in the morning.

One should sleep alone, and occupy the room alone.

Care of the Sputum

The sputum (expectoration) should be received in one of the many sputum cups in use, or in a cuspidor with water or a disinfectant in it, which should always be kept covered and the contents burned one or more times a day. In coughing a piece of cloth or a Japanese napkin should always be held before the mouth and subsequently burned. Strict personal cleanliness should be observed, the mouth and nose washed out several times a day, and the hands always washed before eating. If any sputum should accidentally get upon the floor, furniture or clothes, it should immediately be wiped up with soap and hot water, or with a five per cent. solution of carbolic acid. The sputum should never be swallowed, for it may cause further infection. One, of course, should never spit anywhere except in the proper receptacle. If the handkerchief is used in coughing or for the sputum, which is bad practice, it should be washed in boiling water before becoming dry. All soiled articles of wear should be first boiled before being washed. All table utensils should be reserved for the patient alone and separately washed in boiling water.

How the Day Should Be Spent

From seven to ten hours should be spent out-of-doors daily, winter and summer, and a good deal of this time is to be spent at rest, especially at the beginning of the treatment. If there is fever—a temperature of 100° or over—absolute rest is required. A comfortable reclining chair is employed for the open-air rest "cure," for the recumbent position has been found to be the most comfortable and favorable one. In resting out-of-doors, such a place should be selected as will permit a good circulation of air, and in the sunshine, though it is well to protect the head from the direct rays of the sun. Either a piazza, balcony or some place in the yard about the house is suitable; or even on the house top. There should be protection from the wind.

While lying in the reclining chair, one can occupy the time in various simple ways: reading some unexciting literature, like Miss Austin's novels, for example, books of travel, history, humorous tales, like those of Mark Twain, etc.; or he can engage in some simple handiwork, such as basket weaving, wood carving, paper cutting, etc., or play an unexciting game with a friend, though much talk-

ing and visiting is generally a useless expenditure of strength. If the patient is fortunate enough to have a pleasing stretch of landscape before him he will often be content to enjoy the view and so let the hours go by, as the passenger on the ocean steamship spends hours and days sitting idly in his chair simply watching the ever-changing scenery of sky and sea. A patient who was taking the open-air "cure" once remarked to the writer that it took him so much time to do nothing that he had no time to write a letter. In the homes of the city poor, the house top, the back yard, a piazza, when there is one, an improvised balcony, or even the fire-escape, will serve for the out-door life.

Day Camps and "Classes"

The day camp is an admirable and inexpensive method of affording out-door life during the day to those who must remain at home, in poor quarters, or crowded portions of the city, or while waiting for entrance into a sanatorium. For its location an open space is selected in the environs of the city, where there is a free circulation of air, and, if possible, the shade of trees. The equipment is simple,—one or two rude buildings for the kitchen,

KEEPING WARM IN WINTER WHILE TAKING THE CURE.

physicians' examining office, etc., and a large dining tent or other structure. The consumptive comes to the camp in the morning and spends the day in his reclining chair under the trees. He is under the supervision of the attending physician, and receives several nourishing meals during the day. He returns to his home at night, to come again the next morning, thus spending each day, for weeks or months, out-of-doors. Excellent results have been obtained from this effective method of out-door treatment, and experience has shown that it can be continued throughout the year.

The tuberculosis class has become a popular and very useful method of treating small numbers of poor patients in their homes in a large city. It consists of a small group—a class—of consumptives, who are under the strict supervision of the physician of the class, whom they meet regularly once a week, and who discusses with them the details of the past week and advises them as to their future course. Each patient keeps a diary of his condition, the food and milk taken, exercise, the number of hours spent out-of-doors, his temperature and pulse, general condition, etc.

In addition to the weekly class meetings, a

nurse visits the patients at their homes and sees that they carry out the treatment. Such classes are often supported by churches and are given the name of the church which has charge of them, as the "Emmanuel Church Tuberculosis Class," which was the original class of this kind, and was the happy conception of Dr. Pratt of Boston. The patients are aided pecuniarily when necessary by funds contributed by the church. Tents, reclining chairs, sputum cups and paper handkerchiefs, and, in special cases, food are furnished. After recovery the patients are often aided in securing proper employment.

By means of this admirable method of home treatment, many lives have been saved and returned to work. Many cities and other countries have taken up this system. The educational value of the class system is great: not only the patients, but their families and friends are taught by observation and experience the beneficial effect of fresh air and proper hygienic living, both in the recovery and maintenance of health. While under treatment the patients are required to devote their entire time to it.

Sleeping Arrangements

The night should be passed either out-of-doors or in a large room with wide open windows; in the former case some of the many arrangements for out-door sleeping can be employed. The patient should go to bed early and accustom himself to sleep from nine to ten hours. Indeed, life in the open air, as everyone has experienced, conduces to long, sound sleep. As a further preparation for sleep, the evening hours can be passed in a quiet, restful manner, so that

> "The cares, that infest the day,
> Shall fold their tents, like the Arabs,
> And as silently steal away."

In sleeping out-of-doors during the winter, it is important that enough bed and body clothing should be used to make one comfortable,—blankets, eider-down quilts, woolen pajamas, or a sleeping bag of some heavy woolen material, a hood or helmet for the head, and woolen socks, will accomplish this, and thus clad like an Arctic traveler, one can brave the severity of almost any winter's night and be comfortable. Those who are accustomed to out-door sleeping speak with en-

thusiasm of the refreshing sensation when they awake in the morning.

Exercise

After a little time, when the treatment is well established and there is no fever, some exercise may be taken, but only upon the advice of the physician. For the majority of patients, walking is probably the best and safest exercise, but whatever it is, it should never be violent or excessive. If it is walking, it should be leisurely and not fast enough to cause coughing, shortness of breath or fatigue. All exercises which require considerable exertion and rapidity of motion, like horseback riding, tennis, bicycle riding, and the like, are unsafe, and many a consumptive has gone to his destruction by indulging in them. Games requiring little exertion, like croquet, are allowable. No exercise should be taken before or directly after meals. A good general rule is to take only so much exercise as does not interfere with the favorable progress of the disease towards recovery. "More consumptives kill themselves," says a German authority, "by doing too much than in any other way." Lung gymnastics and deep breathing

exercises for expanding the chest are sometimes advised, but they should never be taken except with the sanction and under the supervision of the physician. Many good authorities are opposed to all such exercises and consider them harmful: the diseased lung, they contend, like other diseased portions of the body, heals sooner by rest or the avoidance of all unnecessary exertion. As recovery progresses, both greater physical and mental effort may be allowed, for it must be remembered that the habits of confirmed invalidism, so fatal to future usefulness, may be formed while the "cure" is taking place. In certain sanatoria the inmates who are on the way to recovery are gradually accustomed to do a little more work, and a little and a little more severe, until by the time they have recovered they can do more or less of an ordinary day's work.

Food

Someone has said that "a consumptive who does not eat is a consumptive lost," and it is quite obviously true. No perfection of the open-air life will avail without good nutrition. Good and nutritious food in abundance, and

good digestion, are vital to the success of the open-air treatment. The test as to whether or not a patient is being properly nourished is a steady gain in weight until the normal is reached. If the digestion is good, a mixed diet consisting of proper proportions of the proteids, fats and carbohydrates, such as meat, vegetables, bread and butter, milk, eggs, various fats, fish, fruit, soups, etc., taken at the usual times may be sufficient. If the weight and strength are deficient, probably the three meals will have to be supplemented by between-meal lunches, consisting of milk, raw eggs, bread and butter, cocoa, chocolate, soup, etc.

The food should be varied, well cooked and served in a tempting manner. The appetite is not always a safe guide. The main thing is to eat and digest the proper amount of food, for the appetite, like rumor, "grows by what it feeds on." Generally, however, the outdoor life brings a keen desire for food. Milk is a most important article in the consumptive's dietary, and most persons can take it, although one now and then thinks he cannot. It should be taken slowly or sipped. Sometimes as much as three pints or more are taken

daily in addition to the regular meals, particularly if the patient is below weight. Next in importance to milk are eggs, preferably raw. Fats in liberal quantities are generally essential for the tuberculous patients and are furnished in the form of milk, cream, butter, bacon and olive oil.

The kind and quantity of food, and the hours of taking it, must be carefully arranged by the physician, and it is often well for the patient to keep an exact record of his daily food as well as the number of hours he spends out-of-doors and the exercise he takes. An English authority declares that the important items of a consumptive's food should be ordered in definite amounts and weighed out each day until by practice one has learned to guess at the amounts with sufficient accuracy. Simply to tell the patient to "feed up," as is frequently done, is a very inadequate conception of this most vital part of the treatment. If the question of nutrition is dismissed in this off-hand manner, it will sometimes be discovered, too late, that the patient is "feeding down" to his destruction. One should rest an hour before the principal meals.

It is not, of course, possible in all or many

cases, to provide elaborate menus, or is it necessary, but in almost every household someone can be found, or trained, to prepare the essentials of a proper consumptive diet. With the study of a good cook book, or a treatise on dietetics, or a few lessons in a cooking school, one can learn to do this.

Someone has called eating an act of worship, and at this shrine must the consumptive worship with his whole heart if he would obtain salvation from his disease.

Alcohol in any form is very rarely employed in the treatment at the present time, and should never be used unless prescribed by the physician. The best drink is pure water.

The Hardening Process and the Cold Bath

The open-air treatment may be regarded as a kind of "hardening" process, intended to increase one's general resistance to the disease. The continuous out-door life in itself, in all kinds of weather, and varying temperatures, particularly during the winter season of northern latitudes, is perhaps the most important part of this process.

The application of cold water to the skin, the cold bath, further contributes to this

SLEEPING OUT-OF-DOORS, "THE SKY FOR A ROOF."

hardening process. By its use the action of the skin is increased, the susceptibility to temperature and climatic changes lessened, the appetite improved, and the whole system stimulated. With a delicate person, one may begin with dry rubbing night and morning, either simply with a coarse towel, a rough hand glove, or by wrapping the patient in a coarse sheet and rubbing him over the sheet. Later, moist rubbings can be substituted by means of a wet coarse cloth, or by enveloping him in a wet sheet, beginning with a temperature of 90° and gradually reducing it to 70° or 60°. With many patients, perhaps the majority, in the early stages of the disease, a cool or cold sponge or shower bath can be begun at once. If, however, there is failure of reaction, indicated by chilliness, and a blueness of the skin, the bath must be modified or omitted. The test of the good effects of the cold bath is a quick reaction, a feeling of warmth and well-being, and an improvement of appetite, digestion and circulation.

Dr. Minor of Asheville, North Carolina, gives an easy and simple method of taking a cold bath by the use of no more complicated apparatus than a tin tub, a bath thermometer,

a big sponge, salt and a rough Turkish towel. His method of procedure is as follows: One or two buckets of water and a handful of sea salt are placed in the tub, the water, on beginning the bath, being at a temperature of 100° F., which is reduced a degree every day until 70° to 55° is reached. The patient saturates the large sponge with water, stands erect, holds it over his shoulders and neck, and squeezes out the whole volume at once, in a shower down his back and neck, thus producing a douche. This is repeated rapidly over all parts of the body for about half a minute; then the patient jumps out, rubs off briskly with the rough Turkish towel and at once dresses. Instead of the sponge, a pitcher of water can be used.

There are many other methods of applying water for its stimulating and hardening effect, such as the cold friction by means of a wet sheet, a wet pack, the douche and shower baths, but the one described above is the most simple and is within the reach of anyone.

Clothing

There is no special kind of clothing for the tuberculous individual different from that

worn by any well person. He should be clothed so as to be comfortable, and no more than will accomplish this. Unduly heavy clothing has a tendency to relax the skin and produce profuse perspiration upon any slight exertion, rendering the body more sensitive to changes of temperatures, and more liable to catch cold. The clothing should be equally distributed over the body, and no greater thickness, such as chest protectors, or extra jackets, should be worn over the chest than elsewhere. The under garments should be woolen or merino which contains a certain proportion of cotton, and only of such weight as will keep one comfortable. They should be loose enough to permit a layer of air beneath them that an equable temperature may be maintained. "Inside our dress," says Pettenkoffer, "we should carry the air of the South wherever we may be. We live in our dress like an unclothed tribe in a Paradisian country where the air is constantly calm and the temperature from 75° to 94°." The under-clothing worn during the day should be removed at night and thoroughly aired. Women should wear short skirts: trailing ones are a menace both to themselves and those

about them from the dirt and dust they collect.

Precautions and Mode of Life After Recovery

As pulmonary tuberculosis is a disease, for the most part of in-door life, the out-door life is one of the principal factors, as we have seen, in the accomplishment of the cure. After recovery, therefore, the out-door life, so far as possible, should be continued. Indeed, very much the same general plan of life pursued during the treatment is to be the guide for one's subsequent mode of living. Sometimes it will be possible for one to adopt some out-door occupation, or, if the in-door life must be resumed, one can embrace every opportunity to spend a certain amount of time daily out-of-doors: for example, by walking to and fro from one's place of business, an evening walk, sleeping out-of-doors, and spending the holidays in the open air.

The "night camp" is a recent development, by means of which the city worker who has recovered from tuberculosis can go out into the suburbs and sleep under fresh-air conditions impossible for him to obtain in the city. Upon a suitable open space, specially

designed buildings are erected, where one can sleep with an abundance of fresh air or even out-of-doors, and after a good breakfast in the morning return to the city for his day's work. By this means it is hoped that many a relapse will be averted.

In some instances an in-door occupation can, to a certain extent, be converted into an out-door one by working with open windows, and securing a free circulation of air.

Especial precautions should be taken for several years after recovery, for if a relapse occurs it is more likely to happen within this period; indeed, the cure cannot be considered absolute until at least two or three years have elapsed. Excessive physical and mental exertion is to be avoided as well as all excesses. If there are any indications of retrogression from the normal standard of health, such as loss of weight, strength, appetite, etc., the temperature should be taken for a number of days, and if any fever is present, treatment must at once be resumed. A cold, the "grippe," or any respiratory disease must receive immediate and careful attention. Sufficient rest, pure air, good food, the avoidance of overexertion, and the general conservation of

energy are cardinal principles of living ever to be borne in mind by the cured consumptive.

The objection may naturally be urged that to treat a case of tuberculosis with all the attention and detail outlined above would require the command of considerable pecuniary means as well as one's entire time for an extended period, and would, therefore, be beyond the reach of many consumptives. True, the ideal plan of treatment does require both time and money: it could not be otherwise with a disease whose treatment depends upon the prolonged influences of hygienic measures to restore the lost power of resistance. From the ideal plan, however, modifications can be made according to the exigencies and limitations of the individual case; and it is better to have a standard and to come as near to it as one can, bearing always clearly in mind the great general principles of the treatment.

A Suggestive Daily Routine

The physician, after a painstaking examination of the patient and a careful consideration of his individual condition, alike as to his disease, his environment, and social and pecuniary state, prepares a plan of treatment in

detail, and thenceforth exercises a constant and close supervision over him. Nothing is left to chance or the caprice of the patient. The physician must command and the patient must co-operate with him and obey. The following is a suggestive daily routine, such as the physician prepares, for an average patient in the early stage of the disease, whose general physical condition is good and who has no fever.

7 or 7.30 A. M. Arise and take a cool or cold sponge bath in a warm room, and then dress. On awakening or while dressing, a glass of hot milk, bouillon, a cup of weak coffee with cream, or cocoa may be taken as directed.

7.30 or 8 A. M. Breakfast, which is a substantial one, consisting, for example, of weak tea, coffee or cocoa, a cereal with cream and sugar, some meat, or bacon with eggs, bread and butter, and milk.

8 or 9 to 11 A. M. Rest in the reclining chair and whatever exercise is ordered.

11 A. M. A glass of milk, a raw egg or a light lunch of some kind if ordered.

11 to 12 M. Rest or exercise as ordered.

12 to 1 P. M. Rest in the reclining chair

out-of-doors, or in one's room with open windows.

1 to 2 P. M. Dinner of a liberal mixed diet, consisting of soup, meat, vegetables, bread and butter, milk and some simple dessert, and fruit.

2 to 2.30 P. M. Rest.

2.30 to 4 or 5 P. M. Rest in the reclining chair or a walk if ordered, shorter than in the forenoon.

4.30 or 5 P. M. A light lunch of milk, etc., as in the forenoon.

5 to 6 or 6.30 P. M. Rest as before dinner.

6 or 6.30 P. M. Supper, which should be a substantial one.

7 or 7.30 to 9 or 9.30 P. M. In a well-ventilated room, or upon the piazza when the weather permits.

9 to 10 P. M. Retire, and just before retiring a glass of milk.

The lunches may be omitted if the nutrition and weight are satisfactory.

Of course the above day's plan is subject to change as indications arise, according to the discretion of the physician.

The weight is to be taken every week.

Thus, it will be seen that to get well of

tuberculosis requires the persistent and continued adherence to a strict daily routine, but the habit is soon established, and one is sustained by the reasonable expectation of a successful result, if he perseveres in the treatment.

Some Aphorisms for the Tuberculosis Patient

1. "The labor which best repays a sick man is to get well."

2. "Desire but one thing" (to get well) "and that with all the heart."

3. "Whatever thou takest in hand remember the end, and thou shalt never do amiss."

4. "Whatever is worth doing is worth doing well."

5. "Where sunlight enters not there the physician goes."

6. "He that taketh heed shall prolong his life."

7. "Life is not to live, but to be well."

8. "He who has health has hope, and he who has hope has everything."

9. "Be intent only on that which thou art now doing and on the instrument by which thou doest it."

10. "Your most important duty is to get well. Let all other duties be secondary."

IX. TUBERCULOSIS AND CLIMATE

TUBERCULOSIS is no respecter of climate, but "extends over every part of the habitable globe." "It is," as has been said by Prof. Hirsch, "emphatically a disease of all times, all countries, and all races. No climate, no latitude, no occupation, no combination of favoring circumstances forms an infallible safeguard against its onset." Cold or dampness does not produce it, or warmth prevent it, for neither one nor the other destroys the tubercle bacilli, and when a favorable soil in the individual exists and he is exposed to the bacilli a sufficiently long time, he will contract the disease in whatever climate he may be.

One would, however, naturally suppose that in those regions where the climate is "favorable," as we say, permitting a constant outdoor life, the opportunities for being brought in contact with the germs would be less, and the conditions for resisting them more favorable. Such undoubtedly would be the case

and, indeed, has been found to be so provided other conditions, such as sufficient and wholesome food, pure air at night as well as day, and, in general, good hygiene and sanitary conditions, prevailed. For example, a person living a wholesome life on a ranch in Southern California, Colorado or New Mexico, where abundant sunshine, pure air, dryness of atmosphere, and but little rain were the climatic characteristics throughout the year, would probably be less likely to contract tuberculosis than upon a New England farm where the weather conditions in the winter and spring were distinguished by much cold moisture, frequent storms of snow or rain, and much cloudiness, compelling one to pass a very considerable amount of time in-doors. And the same argument holds good in the treatment of tuberculosis, other things being equal, as we shall later discuss. "If sunlight is good at all," says Dr. Knight, "why isn't it better to have twenty-five or more days of it per month than to have ten or twelve or less?"

Unhygienic Conditions in Cities

In the cities, however, unfavorable hygienic

conditions, particularly overcrowding, poor nutrition and impure air at night exercise their baneful influences just as surely in the favorable as the unfavorable climates. For example, in the South and in the tropics where the climate favors a constant out-door life, tuberculosis is one of the most frequent diseases in cities situated in these regions, as in Havana, Rio Janeiro, Alexandria, Egypt, etc. In the high altitudes, which were supposed to be particularly free from tuberculosis, as well as favorable for its cure, densely populated cities, like Mexico City, Bogota, Quito in South America, etc., again show a large mortality from tuberculosis. In Bogota the persons affected by tuberculosis were found to belong to the lowest and poorest class of the population who lived in most unfavorable hygienic conditions. A good climate will not counteract bad living conditions.

So long as the Indians led a nomadic life on the Western plains, they rarely suffered from tuberculosis, but when they changed this free life for a confined one in barracks, and lived in closely settled communities, they readily contracted the disease and suffered severely from it. In a community of 400

Apache Indians taken from a free nomadic life in Arizona and New Mexico and transferred to Alabama, where they occupied log cabins, the deaths from tuberculosis in five years was 78, or 43⅓ per cent. of the total number. "In his original life," says Commissioner Leupp, "the Indian had no permanent home, and his pursuits were all such as kept him out-of-doors and hardened his body. When his tepee became surrounded with filth, he moved it to a fresh spot. He wore little clothing—in some places almost none. Exposure to the open sunshine, a hardy meat diet, and a scattered and ever-moving population were pretty sure defense against germs. Times have changed. The Indian can no longer roam everywhere at will. He overburdens his body with modern clothing. He has been taught to live in a cabin, in which he nails down the few windows, caulks the cracks and sets up a stove which he heats red-hot. In the one or two rooms of this dwelling he eats, sleeps, rears his family, entertains his large circle of friends—expectorates, sickens and dies. All the conditions are perfect for the spread of tuberculosis. In due course of time his com-

munity becomes a nest of infection for the larger white community that is fast growing up about him." In the islands of the West Indies, tuberculosis is very prevalent among the colored population, though they live an out-of-door life under sunny skies. This is largely due, it is believed, to the habit they have of shutting themselves up tightly at night in their crowded cabins from an unreasoning fear of night air.

Among the Scandinavians in the country regions of Minnesota tuberculosis is said to be more prevalent than in the cities of that state, and the cause is attributed to the fact of their in-door life without proper ventilation during their long, cold winter. The cold, dry climate of Minnesota is a wholesome one, and was regarded as favorable for the cure of tuberculosis, but it is powerless against in-door life and impure air.

Consumption Rare in Out-Door Life

Any favorable climate must be utilized to be beneficial, and an unfavorable one, if rightly made use of, by breathing fresh air day and night, is of far more value in maintaining one's health or in the recovery from

tuberculosis. We see, then, that it is not alone the climate of a place which is conducive to tuberculosis or its cure, but the way people live in that climate.

"There is a vast mass of evidence," says Lindsay, "which conclusively proves that consumption is comparatively rare among those who follow an out-door life under normal and healthy conditions; that it is comparatively common among those who live habitually indoors, and that it attains its maximum incidence among those whose occupation involves prolonged confinement in a vitiated atmosphere."

In the treatment of tuberculosis, climate has played an important rôle, more so in the past perhaps than at the present time. (Experience in sanatoria, which have been established in all kinds of climates, as well as experience in the home treatment, has taught us that any climate where the air is pure and free from dust, and there is protection from high winds, is favorable for the treatment of the disease. Dettweiller, who established the famous sanatorium at Falkenstein in Germany, which possesses a climate much like that of New England, once told the writer that he could cure

tuberculosis in any climate, and surely his success in his own sanatorium has proved his statement.

Climate Only One Factor

It is the combination and painstaking application of all the several units of the open-air treatment which bring success, and not climate alone, upon which so great reliance was formerly placed. Careful medical supervision, rest, proper and abundant nourishing food, mental repose, and, in brief, the most careful regulation of the patient's life, are as essential as climate. "Is there not, then," one naturally asks, "any value in what are called favorable climates for the consumptive, such as those of Colorado, Southern California, the southern pine belt, Asheville, the Adirondacks, and many others at home and abroad?" Long experience has shown that "favorable" climates do have an added value in the treatment over what we might call the indifferent or unfavorable climates, such, for example, as that of New England in the winter, provided always that the other factors in the treatment are at hand.

The great mistake so often formerly made,

and which has brought discredit upon climate, was attributing to it more than it could alone and unaided perform. The consumptive was so often told to change his climate,—go to this or that health resort and there stay until he got well or worse. He was left in ignorance of the importance of the other steps in the treatment, or if he had some inadequate conception of them, it remained with him to carry them out when and how he pleased, or not at all. If he did not improve under these conditions, it was not the climate that was at fault, but a disregard of the other equally important factors in the treatment. "If I were afflicted with tuberculosis," says Dr. Pottenger, "I would rather be treated in an intelligent manner in the most unfavorable climate than undertake to regain health alone in the best climate on earth. However, I believe my chance of cure would be materially increased, if, combined with intelligent treatment, favorable climatic conditions were also present."

By the *climate* of any place, we mean the average weather conditions of that place, which are the temperature, humidity, the movement of the atmosphere (the wind), the

condition of the sky as to clouds, fog, rain or snow. By *weather,* we mean these conditions observed at a particular time; thus, the winter climate of northern New England is cold, more or less damp, with a considerable snow fall, and a good deal of cloudiness; but the *weather* of any particular winter may be comparatively mild with little snow.

The Most Favorable Climate

The kind of climate which it has been found is most favorable for tuberculosis is one which affords a large number of pleasant sunny days; is dry; is not subject to frequent and extreme changes of temperature, or to high winds, and which has a pure atmosphere as free from dust as possible. It has also been found that a cool or cold climate, such as the Adirondacks in winter, gives better results than a warm climate; the stimulating influence of the cold is of value.

After a careful investigation, a committee of experts of the National Tuberculosis Association came to the following conclusions regarding the value of the different climatic elements in the treatment of tuberculosis, which, perhaps, as nearly expresses the truth

upon this subject as it is possible to reach at the present time. They place first, of course, pure air, and, next, sunshine. "The indirect effects of sunshine," they say, "as seen in the powerful stimulation of the patient's spirits, is of great importance." Dryness of the air is placed next, and is regarded as a most important factor. Equability of temperature is not considered of importance, except in the case of elderly persons or the very feeble. Wind they consider only harmful when the patient is directly subjected to it. Altitude, as in the mountain resorts, such as in Colorado or Switzerland, is regarded of more or less value on account of the greater purity of the air, and the stimulating effect upon the appetite and nutrition. "On the whole," continues the report, "low relative humidity (dryness) with moderately low or low temperature is most generally suitable, and the average tubercular patient always makes his best gains in cold, dry weather where such conditions prevail."

Another influence of a favorable climate, sometimes forgotten, is the comfort and happiness of the patient. To make the "cure" under sunny skies, with the stimulating effect

of a dry, clean atmosphere and the inspiration of pleasing scenery, is obviously less of a task and involves less monotony than taking the treatment in a climate of storms, much dampness and preponderance of cloudy weather. Other things being equal, one would prefer to spend the days of treatment in the sunny climate of Colorado, New Mexico or Aiken, S. C., than in the cloudy one of New England. A man is happier and more contented in the sunshine than in the cloud, and contentment goes a long ways in the "cure." Individuals arriving in a climate, it is said, where the sun is obscured by fogs and clouds for weeks at a time suffer depression of spirits, loss of appetite, digestive disturbances and home-sickness.

Why a Change of Climate

In former days, before the exact methods of the open-air treatment were so well established, and before there were any sanatoria in the country, a change of climate was considered the only thing which offered any prospect of improvement or cure to the tuberculous person, and, generally, a warm summer climate, like Florida or Bermuda, was chosen.

The disease was often not detected until it was well advanced and the patient was having active symptoms, such as cough, fever, chills, and night sweats, and, in consequence, had become much enfeebled. Or, if discovered early, it was not considered serious until these symptoms occurred, particularly the cough. Under these conditions, it was very natural to select a warm, sunny climate where one could be made comfortable out-of-doors with very little exertion on his part. Comfort was obtained and life prolonged in some cases, but rarely was the disease cured or arrested; generally the poor patient came home to die. Later, after the warm climates lost their popularity, the high altitude climates came into notice, and in this country Colorado became the Mecca for consumptives, and in Europe Davos became famous as a tuberculosis health resort and remains so to this day.

At the present time, if the disease is in an advanced stage, the consumptive is advised to remain at home as the most suitable place for his condition.

Selection of a Climate

If the disease is in the early stage, without

fever, and a change of climate is considered desirable, such a one is selected as will, in conjunction with the other factors in the open-air treatment, offer the best prospects of cure. The patient either goes to a well-conducted sanatorium in the resort selected, or else is put under the care of an experienced physician who carefully and constantly keeps him under supervision. Under such conditions many cures are effected and climate is made valuable.

When the change of climate is under consideration, the following points must be carefully determined:

First: The exact physical condition of the patient and his disease,—is it a suitable case to send away?

Second: What is the climate best suited to him and the stage of his disease?

Third: The sanitary condition of the resort selected; the accommodations; possibilities of obtaining proper food; and a reliable local physician.

Fourth: The material condition of the patient: can he make the change without pecuniary worry?

Fifth: The influence of the change of cli-

mate upon the relatives or friends who may accompany him.

When once the resort which seems best adapted to the case has been selected, the name and address of a reliable physician at the resort is to be obtained, and the patient is to be placed under his guidance and control. Any attempt of the home physician to control or direct the treatment at a distance is unsatisfactory and unfair to the patient.

A change of climate is a serious matter, requiring a knowledge of climate and health resorts on the part of the physician, and should be advised only after careful consideration of all the factors in the case. Unfortunately, the patient sometimes makes a change on his own responsibility or on the advice of friends,—a dangerous thing to do. It may happen to be right, but it is more likely to work irreparable injury.

There are many so-called health resorts which possess to a greater or less extent the elements of climate which, as we have seen, are regarded as especially favorable for the treatment of tuberculosis. There are those of greater or less altitude, and those at or near sea-level; some with a cold, rigorous winter

climate, others with a comparatively mild one; some that are winter resorts only, and others that are serviceable all the year.

The Essential Climatic Factors

When any health resort is under consideration as applicable to a case of tuberculosis, we must first learn the essential climatic facts of the resort in order to form an opinion as to its availability.

First, Temperature: We must know the average daily temperature for the season in which one visits the health resort: if a winter resort, the average winter temperature; if an all-the-year resort, the average temperature for the whole year. Then, it is important to know the average daily range of temperature in order to judge of the equability of the climate. Again, we want to know what extremes of heat and cold have occurred in the resort in the past; for these extremes of temperature, as Dr. Richards has well put it, are the "chances the invalid has got to take in any resort; they do not indicate what temperature he may expect, but what it may be his good or evil fortune to encounter."

Second, Humidity: The humidity is an-

other important factor to determine in order to judge of the dryness of the atmosphere. Next comes the average rainfall; the direction and velocity of the wind; and, finally, what we may call weather data, namely, the average number of clear, fair, rainy, and cloudy days. This enables us to determine the amount of clear sky and sunshine one may expect at the resort, and hence the degree of out-door life one can enjoy. If the resort is one in the snow belt, like Saranac, or Davos in Switzerland, it is important to know the amount of snowfall and the length of time snow lies continuously on the ground, and when it begins to melt in the spring.

Third, Land Configuration: We must also learn something of the form of the land,—whether level, hilly or mountainous. A hill or mountain affords protection from high winds. Moderate ascents are often of value for exercise, as Brehmer utilized them at Goerbersdorf for his consumptives.

Fourth, Soil: Again, we desire to know the character of the soil, and the kind of vegetation; whether the region is well-wooded or not, and the character of the forests. The fir, pine, spruce and other evergreen trees are

generally considered an advantage to a health resort on account of their shade and balsamic exudations.

Fifth, Facilities for Comfortable Living: There are other essential qualifications than those of a purely climatic character which should be possessed by a health resort. For example, it is important for the invalid to know what facilities exist for comfortable living: that the water is pure and the sanitary conditions good, and the board of health efficient. He should know that the house he is to live in has been efficiently disinfected, if it has been previously occupied by a consumptive. He should also find out whether or not he will be received into the hotels or even the resorts, for many places dislike the presence of consumptives and many hotels will not receive them.

Various Health Resorts in America

There are many resorts in this country which have proved their value in the climatic treatment of tuberculosis and which still retain their popularity. The Adirondacks have become widely known, principally through Dr. Trudeau and the sanatorium he estab-

lished at Saranac. Asheville, North Carolina; Colorado Springs and other places in that state; Southern California; the dry pine belt of the South as represented by the well-known resort of Aiken; New Mexico; Arizona; and many other places in the great Southwestern plains and uplands, all possess favorable climatic elements for the open-air treatment of tuberculosis and have been extensively employed for this purpose.

The warm, moist climates, like the coast of Florida, Bermuda, and various islands in southern latitudes, are not now regarded as suitable for the effective treatment of tuberculosis: they are too enervating, and do not possess that stimulating quality which aids appetite and nutrition. Long ocean voyages, once much in vogue with the English, are now rarely advised. The air of the ocean is of great purity, it is true, but the obvious disadvantages of an ocean voyage render this method of obtaining the pure air far inferior to favorable climatic resorts on land.

Health Resorts in Europe

In Europe the best-known climatic resorts are in Switzerland, the Black Forest and Mountains of Germany, and the Riviera. Davos, which has already been mentioned, is the most popular high-altitude resort, more frequented in the winter season, when the snow, which covers the ground for a long period, conduces to the purity of the air. The situation of Davos, however, in a narrow valley, renders the days very short in winter, the sun not appearing until about ten o'clock in the morning and setting about four in the afternoon. The Riviera on the shore of the Mediterranean Sea has for many years been a great winter resort for consumptives. The climate, however, is uncertain and the "mistral," the north wind, blows violently at times. There is much sunshine nevertheless, and the attractiveness of the sea and land scenery is most delightful. There are many resorts in the highlands of Germany, in the Black Forest, the Bavarian and Hartz Mountains and the Tyrol, and many sanatoria have been established in these regions. The only very dry warm winter

DAVOS IN SWITZERLAND, THE GREAT RESORT FOR THE TUBERCULOUS.

climate near at hand to Europe is that of the Egyptian desert. It exhibits the climatic characteristics of arid regions in low altitudes, warmth, great purity of air, continuous sunshine, great daily variations of temperature, dryness of the atmosphere, and little or no rain. It is comparable in this country to Southwestern Arizona. Helouan, Luxor and Assouan are the principal resorts.

Dr. Knopf's Ideal Climate

Dr. Knopf has in a single sentence well summed up the whole question of the climatic treatment of tuberculosis. He says: "The ideal climate for the average pulmonary patient, in the earlier and more hopeful stages of the disease, is the one where the extremes of temperature are not great, with the purest atmosphere, relatively little humidity, much sunshine, and all the conditions which permit the patient to live comfortably out-of-doors the largest number of days out of the year and the largest number of hours out of the twenty-four."

A favorable climate is a valuable aid in the treatment of tuberculosis, but it must at the same time be accompanied by all the other

factors in the open-air treatment: competent medical supervision, abundant and good food, rest, and all the hygienic conditions requisite for the "cure." Unless this is the case, climate will prove but an elusive hope.

X. THE PREVENTION OF TUBERCULOSIS

PRESIDENT ELIOT in an address to doctors upon "The Coming Change in the Medical Profession," made the following prophetic remark: "The probability is that the great part of the work of medical men is hereafter to be done in preventive medicine." In regard to tuberculosis, preventive medicine is already a fact, and in the present world-wide crusade against tuberculosis the pre-eminent aim is *prevention.*

Even in the treatment, our efforts are directed towards the early detection of the disease not only on account of the better results obtained, but quite as much because detected and cured at their early period, when it is a "closed" case, before the bacilli occur in the sputum, we prevent it from becoming a source of danger to others.

Two different lines of attack are employed in the work of prevention: the one we may call the direct against the germ itself,—the control of the tuberculous individual and his sputum, which is the direct source of danger; the other we call the indirect, which has for its aim the elimination of conditions which prepare the favorable soil for the seed, the tubercle bacillus. This includes all the vast and varied efforts to improve the social and living conditions of the masses, and so to raise and maintain their power of resistance to the infecting germ. Every movement in this direction is a distinct and definite step in the direction of prevention.

The Direct Attack

Since, as we have learned, the principal source of infection is derived from the sputum of a consumptive either expectorated or coughed out, obviously our first effort is to control this primary source of infection. If, indeed, each and every consumptive with bacilli in his sputum could be absolutely controlled and made a safe consumptive as regards others, tuberculosis would speedily begin to diminish and continue to do so with

increasing rapidity, for we should be constantly reducing the supply of the infecting material. This, however, is obviously impossible, although effort in this direction is steadily increasing, as we shall later see. The difficulty still is that we cannot find out all the tuberculous individuals in any community. Many of them do not themselves know that they have the disease, and even if we could discover all cases, the difficulties of controlling them are well-nigh insuperable. We can, however, through educational means, accomplish much by teaching the consumptive to control himself and by affording as free and easy an opportunity as possible to every one to find out whether or not he has tuberculosis. In some cases an examination of the lungs can be required as a condition of employment, for example, as is already done in some establishments. Education in the simple facts of tuberculosis has already accomplished much in this direction.

The Educational Campaign

The educational campaign against tuberculosis has now become a mighty movement. In every civilized country of the world the

people are now being taught what causes tuberculosis and how to avoid it. They are learning that the sputum carelessly scattered about and becoming dry is the cause of the disease, and that if this is destroyed before it becomes dry, the disease cannot be conveyed to another. Such tuberculosis education, then, is one form of direct attack, for it teaches, as we have said, the consumptive to control himself and the non-consumptive to control his careless consumptive neighbor, or see that he is controlled.

The method of conducting this great educational propaganda is familar to all; almost every device is employed which will attract and interest the public.

The Tuberculosis Exhibition

The most generally popular method has been the tuberculosis exhibition, which has grown from small beginnings to the great international one exhibited in Washington in connection with the International Congress on Tuberculosis in 1908. Here was shown in the most extensive and graphic way what the various states of this country and the nations of Europe are doing in the prevention,

study and cure of tuberculosis. It was a marvelous exhibition, and one could spend weeks in its study. Later, when it was moved to New York, no less than 753,301 persons visited it during the seven weeks of its stay there. One can gain some idea of its magnitude from the fact that it took ten special cars to transport it from Washington to New York. One striking feature of the exhibition is worth while mentioning just here. Against a board suspended between two balconies were three incandescent lights, which at regular intervals for an instant were extinguished and then flashed out again. Under the lights was this sentence: "These lights go out every two minutes and thirty-six seconds. Every time the lights go out someone dies of tuberculosis. Tuberculosis is communicable, curable, preventable." There was always a group of people in front of this design silently watching the lights.

The Traveling Exhibition

Smaller exhibitions go from state to state and city to city, some under the auspices of the National Tuberculosis Association, and others under local or state associations. These

"traveling exhibitions" consist of charts, photographs, maps, models, diagrams, legends, and, in brief, a great variety of material illustrating the study, prevention and treatment of tuberculosis. Such exhibitions are well advertised beforehand in the local press, etc., and during the time of exhibition lectures are given, often with stereopticon illustrations, and literature distributed free. Every effort is made to arouse the interest of all the people in the city visited. In some exhibitions a phonograph with its tireless, if strident and monotonous voice, repeats tuberculous aphorisms.

In the traveling exhibit of the Boston Tuberculosis Association was a realistic representation of two rooms side by side: one, a dark, dirty, disordered tenement house room, wretched in the extreme; and the other, a neat, clean, simply furnished room, with the fresh air and light coming in through the window. One is labeled "The wrong kind of a room," and the other "The right kind of a room." This feature of the exhibit always attracts much attention. On one occasion a little girl, after silently looking at both rooms, remarked to her father who was with her: "Papa, our rooms look just like this one" (pointing to "the wrong kind of a room").

"We've got to move, or we will all die of consumption."

Moving picture plays are now employed to illustrate various phases of the tuberculosis problem, and the motion picture and vaudeville theaters have been utilized for brief illustrated talks upon tuberculosis. In the summer of 1912, a seven-minute illustrated lecture upon "An Out-door Life for Health" was given in 32 motion picture theaters in Boston, 340 times to a total number of 143,635 persons.

The Service of the Public Press

The public press has entered into the educational campaign with great zeal and has immensely aided the movement. Through the press service of the National Association timely articles upon tuberculosis are furnished the newspapers of the country. From recent statistics collected by the National Association, the various newspapers of the United States printed articles concerning tuberculosis, which, when measured, amounted to over 50,000 column inches of space in two weeks. If all this matter were gathered together at one time, it would make a newspaper of the ordinary size, of 359 pages of solid printed matter, without any advertisements, all on the subject of tuberculosis. If it were arranged

in one long chain, it would make a single column four-fifths of a mile long and two and one-quarter inches wide. Tuberculosis, then, is receiving "half a mile of publicity a week," as the National Association says.

Popular illustrated lectures, pamphlets, leaflets, illustrated placards, issued by states, cities, boards of health and tuberculosis associations, still further disseminate tuberculosis knowledge, so that it would seem that soon every individual must have learned the simple facts concerning the prevention of tuberculosis. School books on physiology and hygiene now include the subject of tuberculosis, and in the State of Massachusetts, and perhaps in others, instruction upon the prevention of the disease is required by law to be given in all public schools.

Compulsory Notification

Another direct means of attack is compulsory notification, that is, a law requiring all physicians and hospitals to notify the board of health of every case of tuberculosis coming under their observation, on the ground that tuberculosis is a contagious disease and therefore dangerous to the public health. Such compulsory notification is now required in a number of states and practically all the larger

cities in this country and in various countries abroad. The object of this requirement is to enable the health authorities to locate the cases of tuberculosis and keep them under supervision. This applies more particularly to crowded living localities where the dangers of infection are greatest. This law requiring notification is not intended to disturb the consumptive, but to make sure that he and his family are properly instructed as to the care of the sputum and the avoidance of infection, —it helps the consumptive and protects his family.

Another important means of prevention is the free examination of suspected sputum in state and city laboratories, as has been before referred to. If the sputum is found to contain the tubercle bacilli, the health authorities are thus informed of the existence of the case and where it is situated.

Again, laws and ordinances against indiscriminate spitting in public places is a preventive measure. Some of the dangers from this vulgar habit have been already considered. If a consumptive is obliged to go about, he can provide himself with a pocket flask, or some pieces of cloth or Japanese napkins, which, after being used, can be deposited in a paper or rubber bag; or one can have a

rubber-lined pocket, and on returning home the sputum can be burned.

It has been found that laundry workers suffer severely from tuberculosis, probably through infection from contaminated linen: hence, the importance of first boiling all articles before being handled or washed. With a known consumptive, all his soiled linen should be put in a bag by itself and boiled.

The Tuberculosis Dispensary

The free tuberculosis dispensary, a comparatively modern development in the warfare of prevention, is an instrument of preventive medicine, the value of which, as Dr. Philip of Edinburgh, who established one of the first institutions of the kind, says, it would be difficult to overestimate. Its value is not so great in treating the poor consumptive, important as that is, as it is in protecting his family and the community. The dispensary affords a free and easy opportunity to every poor person for an examination of his lungs if he suspects he has tuberculosis. In this way many early cases are discovered and given timely treatment. When a case is discovered, the visiting nurse goes to the patient's home, investigates the hygienic conditions, shows the patient how to live so as not to endanger

A TUBERCULOSIS DISPENSARY.

other members of the household, and, what is, perhaps, the most important part of all, urges all the members of the family to be examined at the dispensary. Thus other cases in the same home are not infrequently discovered. This home inspection is repeated periodically, and the consumptive is never lost sight of. From the view-point of prevention, the protection of the consumptive's family is the chief consideration. Almost every city now contains one or more such dispensaries, and some of them are opened at night for the accommodation of those who have to work by day.

The Isolation of the Dangerous Consumptive

Do what we will through education and the dispensary, with its visiting nurse and home supervision, there will always remain a certain number of consumptives who are far advanced in the disease and in a hopeless condition, who, through ignorance, helplessness or wilfulness will not safely dispose of their sputum and who thus expose to the infection other members of the household. Such cases are always found in the homes of the poor. What shall we do with these sources of infection? The only way is to remove them to consumptive hospitals and thus isolate

them. This is no hardship to the poor bed-ridden consumptive, for he will receive far better attention than in his miserable home. "The advanced consumptive," says Dr. Jacobi, "is the real danger to the family and community. A dying consumptive should be removed to a healthy, comfortable place to die in without endangering the community; this is the only way in which the epidemics of chronic diseases may become extinct."

Mr. Schiff, President of the Montefiore Home, declares that the isolation of phthisis sufferers in an advanced stage should be made compulsory by law. It is well known that no general hospital will now receive in its wards persons suffering from tuberculosis on account of the danger of infecting other patients; therefore, especial hospitals must be established for the advanced consumptive, and such hospitals are the greatest need in the United States at this time, and this is being done in a number of States by the establishment of local consumptive hospitals, as in New York, Minnesota and Massachusetts. The state sanatorium has been and is a more popular movement, but the greater need from the point of prevention is consumptive hospitals for the advanced and dangerous cases, whose isolation will undoubtedly do more to

prevent and control the disease than any other one means.

"There can be no manner of doubt," says Dr. Philip, before quoted, "that the far-advanced or dying cases constitute the greatest source of infection." Dr. Newsholme, a medical health officer of England, after a very thorough and painstaking investigation into the disease, and the life and environment of the people which influence it, found that the diminution of tuberculosis bears a constant relation to the amount of institutional segregation—of isolation in hospitals—that the greater the hospital accommodations for isolation the greater the diminution of tuberculosis. In England and Wales, Dr. Newsholme says that a large and continuously increasing amount of institutional segregation has been uniformly accompanied for nearly 40 years by a large and continuous decrease of the disease. None of the other indirect means, he says, whether it be less crowding, diminution of poverty, increase in wages, better food, shorter hours of labor, etc., though they have had an assured influence, has shown such uniform variation with the death rate from tuberculosis as has isolation.

London itself, which has for many years possessed a number of large hospitals for con-

sumptives, has a low death rate from the disease, 13.46 per 10,000—less than half that of Paris, in which latter city, although a large proportion of consumptives enter hospitals, they remain but a few days, and hence such short isolation cannot have much influence in reducing the total infection. In New York City, where the diminution of tuberculosis has been marked and rapid, from 42.7 per 10,000 in 1881, to 16.6 in 1912, every case of advanced disease has an opportunity of being treated and isolated in a hospital on an average of twenty-one weeks and liberal provision has been made by the city for this purpose.

Disinfection

Another direct preventive measure is the disinfection and renovation of the premises which have been occupied by a tuberculous individual. Since tuberculosis is now classed with the other infectious or contagious diseases in most communities, the law requiring disinfection for such diseases applies to tuberculosis.

Infected rooms or tenements have been found to be instrumental in conveying the disease to new and unsuspecting tenants. In the "Lung Block" in New York City, 265

cases of tuberculosis were reported to the board of health in nine years, and undoubtedly some of these were caused by the infection in the rooms from consumptives who had previously occupied them. Cornet and other investigators have proved that the dust in the rooms which were occupied by unclean consumptives contained the tubercle bacilli. Of 311 animals inoculated with dust from rooms occupied by consumptive patients, Cornet found that 167 died soon after infection, 59 were tuberculous, and 85 were healthy. A room in a hotel occupied by a consumptive actress, and a workshop occupied by a tailor who had directly communicated the disease to a fellow-workman, were found infected. But in no case was the dust of the walls infectious when sputum cups were used exclusively to receive the expectorated matter.

Dr. Ransome cites an instance from Laennec's writing of a religious community of women kept in strict seclusion and with somber surroundings, in which Laennec had seen consumption arise so frequently that in ten years' time the population of the institution had been two or three times renewed owing to the mortality of the inmates,—with the significant exception of those who had

charge of the gardens, the kitchen and the infirmary. Undoubtedly much of this mortality from tuberculosis was caused by infected rooms, for in those days the infectious nature of tuberculosis was unknown.

We see, then, how important it is, from the standpoint of prevention, to thoroughly clean all offices, workshops, school rooms, etc., and in dusting to use moist cloths and wet brooms, or, better, the modern method of vacuum removal of the dust. In factories and workshops the cleaning and dusting should be done after the day's work, so that there should be no dust in the air when the occupants reassemble the next day.

Compulsory Notification and Disinfection No New Thing

Compulsory notification and disinfection for tuberculosis is no new thing, for a hundred years or more ago the King of Naples issued the following remarkable decree, almost prophetic in view of what we know and do today: "Every physician," runs the edict, "is henceforth required to report to the authorities every case of consumption the instant it is recognized. Failing this a fine of 400 ducats will be exacted, and for a second of-

fense banishment for ten years. Poor patients should at once he taken to the hospital. Their clothing and linen shall be kept and cared for apart from other patients. In case of death every article must be produced and identified by the hospital superintendent. Any infringement of this law may be punished by imprisonment or the galleys. It is the duty of those in authority to renovate the room of a former patient, floor, hangings and furniture coverings; to burn the window frames and doors and replace them by new ones. The extreme penalty of the law will be visited on anyone buying or selling the effects of phthisical (consumptive) patients. Every house where a consumptive dies shall be blacklisted." In Florence similar laws were enacted.

In New York City no tenement is permitted to be occupied again after the death of a consumptive until disinfection has been done to the satisfaction of the board of health, which performs this office free. This is also required in some health resorts and should be in all.

The fundamental idea in disinfection is really cleanliness, "surgical cleanliness," as one might call it. Indeed, if absolute cleanli-

ness were always maintained in the sick room of the consumptive, there would be no need of disinfection, as the experiments of Cornet, above cited, have shown, for in rooms where the sputum was properly disposed of, no tubercle bacilli were found in the dust. But as we can never be sure of this ideal cleanliness, we must safeguard the after-comers by disinfection.

Methods of Disinfection

There are various methods of disinfection in use. The one perhaps most generally adopted is a thorough fumigation with formaldehyde gas, the room being, as far as possible, hermetically sealed by putting strips of paper and cotton over the window and door cracks or wherever the gas can escape. In addition the painted wood work is scrubbed with a solution of hot soda, and the walls are repainted and repapered after being thoroughly cleansed. All hangings, bedding, mattresses, pillows and rugs are disinfected with steam, or exposed to the air and sunlight for several days, and all articles of little value are burned. The mere fumigation of the room is not sufficient. Renovation is also neces-

sary,—indeed, renovation in conjunction with scrubbing and washing the room is probably more important and efficient than mere fumigation. Either before or after the disinfection the exposure of the room, by means of wide open windows, to the fresh air and sunlight for several days, is a useful precaution.

The whole essence of direct prevention is, in a word, cleanliness, which, applied to the consumptive, means the proper and safe disposal of the sputum, whether expectorated or coughed out, for "no spit, no consumption," and a clean consumptive is a safe one at home or abroad. So long, however, as the unclean consumptive is, unfortunately, always to be found somewhere, we must either teach him to be clean, clean up after him, or isolate him in a hospital; for, in his efforts to cure himself, he has no right to jeopardize the well community.

The danger from the unclean consumptive is all the greater from the fact that the infection is so slow and insidious in its action. An individual may become infected and experience no immediate results from it; the infection may lie dormant in him for years, and then on a favorable occasion become active.

One seldom obtains a history of any known exposure to infection from some other consumptive; yet it must have sometime in the past occurred and been forgotten.

The Indirect Means of Prevention

The indirect attack in the warfare of prevention is directed against the human soil, and consists in efforts to render it unfavorable for the growth of the tubercle bacillus. We have already seen what influences tend towards the production of a favorable soil, and, consequently, the problem in this indirect attack is to combat and correct these vicious conditions.

"Before any vice," says Dr. Holmes, "can fasten on a man, body, mind, or moral nature must be debilitated." It is the debilitated body which offers the favorable soil for tuberculosis, and, therefore, the influences which produce this condition must be removed and the body raised to and maintained at a resistant level. All the numberless instrumentalities for improving the public health, familiar to us all, are effective weapons in this warfare; indeed, before the discovery of the cause of tuberculosis, improved sanitary and

hygienic conditions were already decreasing the mortality and prevalence of tuberculosis, and they are still most influential, in conjunction with the direct means of control, in the further diminution of the disease.

Tuberculosis a Social Disease

Tuberculosis, as we have said, is often called a "social" disease, because the social conditions, the conditions of living and working, are so influential in its production, and in its prevention. In the struggle to improve the social condition of the masses, we must strive for better homes for the working people, less crowding, shorter hours of work in many employments, and better wages; better sanitary conditions and ventilation in workshop and factory; more thorough school inspection and care of weakly children; open-air schools and open-air school rooms; the prohibition of child labor, and the limitation of hours of work for women in factories and shops,—protection of mothers; opportunities for out-door life by play grounds and parks; provision for wholesome recreation and amusement; pure and sufficient food, clean milk; public baths; better environments for child life; care of the teeth of children through

free dental clinics; instruction in hygiene; fewer saloons, and morally clean cities and towns. In every department of social effort and uplift the worker is indirectly but none the less surely and effectively combating tuberculosis. "All social activities," says Dr. Routzahn, "touch this problem of tuberculosis, and we can make its consideration a medium to agitate for social betterment. Its final solution depends on the solution of all the complex social, political and economic problems of the day."

Someone has called the tuberculosis warfare one of "enlightened selfishness" because the motive of self-preservation is a powerful impelling factor in it. Although the disease is far more prevalent among the poor than the rich, for the latter live under favorable hygienic conditions, still the tubercle bacillus is an ubiquitous germ, and the possibility of contracting the disease is never absent from anybody. A consumptive servant, for example, may infect a member of the household where she serves; or a tuberculous nurse girl the child she cares for: hence all are selfishly and personally interested in taking a hand in

the great warfare and working in some of the many ways of control and prevention, direct or indirect. What a profound sigh of relief the world will emit when finally tuberculosis, as has happened with most of the other great infectious diseases, as we have seen, shall have practically disappeared! and it is within the power of man to do it, for it is a preventable disease.

Three of the most vital points of attack in the indirect means of prevention are overcrowding, alcoholism, and impure in-door air, all of which have been discussed in the chapter upon the "Seed and the Soil." We have seen that overcrowding means dirt, vitiated air and greater opportunities for infection, and in the illustration of living conditions in Paris and London we have seen that tuberculosis increased with overcrowding.

Better Tenement Houses

The healthy housing of the poor in model tenements in the city, or cheap and rapid transportation to the suburbs and the provision of proper homes there, must be accomplished if we are to succeed in the struggle.

Recently both the municipalities and philanthropists have recognized the pressing importance of the housing problem in the city, and much has been done in the way of more stringent laws for tenement house building and inspection, and in the erection of wholesome, well-ventilated tenements. In the writer's opinion, the final solution of the housing problem will be cheap, rapid transportation to land in the suburbs.

Prohibition of Liquor

We have also seen that among intemperate persons an excessive death rate from tuberculosis prevails. Dr. Bertillon, the eminent French statistician, has shown that tuberculosis is twice as prevalent among the retail liquor dealers of France as among other shopkeepers. In the prevention of tuberculosis, therefore, the saloon must be controlled, or eliminated. If for no other reason than the prevention of tuberculosis, State prohibition would be amply justified; and one can only regard with profound satisfaction, from a tuberculosis standpoint, State prohibition and no license in the cities. But behind prohibition must come better living conditions, nutritious food, fresh air, and innocent amuse-

ments, to take the place of the saloon and alcohol.

Pure Air

It is a self-evident proposition that the continued breathing of impure air lowers one's vitality; and, consequently, good ventilation, letting in the fresh air to our houses, offices, schools, public buildings, workshops and public vehicles, is a measure of the first importance in the indirect prevention of tuberculosis. Nowhere, perhaps, is such impure, foul air met with as in the city street cars in winter, though some of our churches are equally as grave sinners in this respect. The public are largely at fault for this condition: they are afraid of fresh air; they want to be comfortable, and when the choice lies between impure air and warmth, which makes them comfortable, and ventilation, which may mean a little colder air and which at first is a little less comfortable, they will, or the average person will, choose the former alternative.

It is so often erroneously believed that cold air and draughts produce colds. Pure air, as we have seen, never does this, for colds are caught from some one else suffering from them, or from the infection scattered about by them. Nansen, the Arctic explorer, endured all sorts of exposure to cold and wet

on his Arctic expedition, yet, he tells us, he never had a cold until he returned to civilized life and slept in a house. With a little training and hardening one can learn to sit in his office or eat his dinner with an open window and enjoy the stimulation of the cool fresh air, even in the midst of winter.

One of the valuable incidental benefits of this great tuberculosis campaign is the emphasis laid upon the importance of fresh air. If fresh air will accomplish such marvelous results in the treatment of tuberculosis as it does, then it must be good for those who are well and desire to avoid the disease. The gospel of fresh air has never been so incessantly and universally proclaimed as it is today in connection with the prevention and cure of tuberculosis. Once one becomes accustomed to an abundance of fresh air, he will crave it almost as the drunkard does his dram, and he will never again, if he can avoid it, subject himself to the misery of impure air.

What has been said above regarding the prevention of tuberculosis applies, of course, to the individual as well as to the public at large; but there are certain precautions which

have a more direct personal application and which it will be well to mention.

Important Points to Remember

In the first place, if one has a "poor constitution," as we say, and is not strong and robust, an out-door occupation is preferable to confinement in-doors; but if he is unable to do this, he should take especial measures to strengthen his body, by exercise out-of-doors, winter and summer, deep breathing, plain and wholesome food, well prepared, well chewed and taken at regular times, and by sufficient rest and sleep with an abundance of fresh air in the bedroom,—and, in brief, an observance of all the laws of health and avoidance of all excesses.

The average person should sleep at least eight hours, alone, in a well-ventilated room, and should breathe through the nose with the mouth shut.

If a cold bath is good for a tuberculous individual, it is equally so for a well person, and one should form the habit of taking it every morning. The teeth should be brushed at least after breakfast and at night on retir-

ing. The mouth should be frequently rinsed, and the hands washed before eating. "Let order and cleanliness have the first place in the whole conduct of life."

A cold or cough should not be neglected, and if any of the early symptoms of tuberculosis mentioned in Chapter VI are observed, one should immediately consult a physician. If it can be avoided, one should not sleep in a room with a consumptive, and if he is obliged to live in a house with one, or work in an office or shop near one, he should see that he properly disposes of his sputum and holds something before his mouth when coughing. One should not put the fingers in the mouth or nose, or any unclean thing, such as money, the point of a lead pencil, half-eaten apples, chewing gum, candy, etc., which others have handled. In turning the leaves of books or handling money or papers, the finger or thumb should not be moistened with saliva. Drinking from a cup or glass used by another should be avoided, unless the vessel has been first thoroughly cleaned. Kissing may carry infection, and one should not kiss a consumptive. In desk work in school or office, avoid a bent position,—let the lungs have full play.

A Clean House and Dust

Live in a clean house accessible to the entrance of air and light, preferably in the suburbs. Twice a year the house should be thoroughly cleaned. In dusting use a moist cloth or, when possible, remove the dust by the vacuum system. Dust is dirt in tiny unseen particles in the air, and contains among other things various kinds of germs, some of which may be infectious. Dust is always a possible danger, and should be scrupulously avoided, as well as disorder, dampness, darkness and bad air. Plain, durable clothing should be worn, just thick enough to keep one comfortable, and if the clothing or shoes become wet, they should be immediately changed. In moving into a house in which a tuberculous person has recently lived, one must be sure that it has first been properly disinfected. This is of great importance in occupying a cottage in a health resort.

Spitting and Cuspidors

Of course everyone should avoid indiscriminate spitting himself and shun all places where it is permitted, and, further, he should try in every way to persuade others from indulging in the habit. It is an evident hard-

ship, however, to prohibit all spitting, and when in the right place it is often a cleanly thing to do, as when one has a cold in the head, or, from other causes, has some uncleanly discharge in his mouth; but it should be done in the right place, in spittoons provided for the purpose, partially filled with water, and which are cleansed at short intervals, preferably by boiling. By a law of Massachusetts, suitable receptacles for expectoration are required in all factories and workshops, the form and number of which to be decided by the board of health of the city or town in which the factory is situated.

We cannot yet destroy all the tubercle bacilli, but we can so strengthen and harden the body that it will be difficult for the germs, even if they do get in, to do harm.

"The struggle against tuberculosis," says M. Casimir Perier, "is intimately bound up with the solution of the most complex economic problems, and any plan will be imperfect which has not for its foundation the material and moral improvement of the people."

XI. THE GREAT CRUSADE AGAINST TUBERCULOSIS

THERE are two profoundly impressive movements taking place in the world to-day, both of which, although in a very different way, have for their ultimate object the preservation of human life. The one is the great Peace movement, whose object is the abolition of war between nations and the settling of their disputes by arbitration; the other is the present world-wide Crusade against tuberculosis. Of the extent and earnestness of this latter movement, the recent great International Congress of Tuberculosis in Washington (1908) is a witness.

Organized Effort Almost Universal

In almost every civilized country of the world organized effort is now being made for the purpose of fighting tuberculosis. While the general methods are and must be the same, each nation modifies them according to its

own peculiar conditions, and its conception of what are the most important lines of attack.

International Congresses

At certain intervals representatives of all the nations come together in a great international congress such as the one just referred to in Washington, where they compare the methods and results of the work in their respective countries, learn new facts regarding tuberculosis and new ways of fighting it, and inspire one another to increased effort. The last such congress was held in Rome in 1912 and the next one will be in London.

The Movement Simultaneous Among All Peoples

Such national and international action against tuberculosis is called the "Crusade," the "Warfare," and "Struggle" against tuberculosis. All classes of people, from the king to his humblest subject, and from the president to the laborer, are engaged in this Crusade. It is a fact of striking significance that the peoples of the world should thus simultaneously set themselves to work to free themselves from this

inveterate foe which for untold years has been preying upon the flower of their youth and manhood. The inspiration of this Crusade arose from Prof. Koch's great discovery of the cause of tuberculosis. Then and not until then could intelligent action be taken. The Crusade began at first slowly, but as time went on and the possibility of the prevention and cure of the disease became more fully realized, the movement began to grow in extent and force until at present, as we have said, it has become world-wide.

Why a Crusade Against a Single Disease?

Perhaps one may ask why such a crusade against a single disease? Other diseases are very prevalent, such as heart, or kidney disease, rheumatism, and, more frequent than all, as we have seen, pneumonia. There are several reasons for this. In the first place, there is no other disease which so habitually cuts down its victims in the best years of their life. Many diseases only occur in later life, and are called degenerative diseases, caused by worn-out organs. Pneumonia, as has already been said, is most prevalent and fatal at the two extremes of life,—before one's work is begun and when it is done.

Again, tuberculosis is a contagious or communicable disease, the cause of which we know, as well as its prevention. We know how to avoid it, to prevent it, to cure it. Finally, it has a steady, continuous prevalence without intermission. Many contagious diseases come in epidemics and then cease; tuberculosis never ceases.

Principal Forms of Activity

The principal forms of activity in the campaign against tuberculosis consist in:

(1) Educational propaganda.

(2) Sanatoria.

(3) Tuberculosis dispensaries.

(4) Tuberculosis hospitals for advanced cases.

(5) Laws and regulations regarding notification, disinfection, indiscriminate expectoration, isolation of advanced cases.

(6) The founding of tuberculosis associations and leagues.

(7) The prevention of tuberculosis in children and care of tuberculosis children.

(8) General improvement of the hygienic and living conditions of the poor in cities by improved dwellings, etc.

(9) Inspection of factories and workshops and improvement of sanitary conditions of the same.

(10) Supervision of the milk supply.

Germany

Germany took the lead in this warfare, and it was quite natural that it should do so, for Prof. Koch, who made it possible, was himself a German. The lines of effort in Germany are various and include both the direct and indirect attack. Their main effort is, perhaps, in the line of the direct attack, the cure of the curable cases, and the protection of the well, particularly the latter. No country possesses so many sanatoria, both public and private, as does Germany. There are considerably over 100 such institutions with 10,000 or more beds, and about 40,000 individuals are treated every year in them. Some have been established, and they are among the best and largest, by the National Insurance Societies, who insure all workmen against disease. Others have been erected by cities, communities, the Red Cross Society, corporations and private individuals. About 65 per cent. of the patients treated in these sanatoria become fully capable of resuming

their former work, an "economic cure," as it is called. To treat its consumptive workingmen in sanatoria in the early stage of their disease, and discharge them in a condition to resume their work, was found to be far more economical than to care for them through a lingering illness.

Compulsory Insurance of Workingmen

One of the most admirable institutions in Germany, which has done more than all other means in this struggle against tuberculosis, is the compulsory insurance of workingmen. Every workingman (one-fourth of the population of Germany) is compelled by imperial law to be insured against sickness, accident and invalidity. Each insurance company secures for the laboring man, in case he is permanently disabled by sickness or accident, an allowance for life. For this purpose the employer as well as the employee are required to contribute their share in equal parts: the highest amount the latter—the workingman—contributes is six cents a week. The most important thing for the workingman as well as for the insurance company is to be able to work and to maintain this working

ability as long as possible. Hence one of the principal objects of the insurance companies is to prolong the working period. Just as soon, therefore, as tuberculosis is discovered in a workingman, he is at once placed under treatment in one of the well-equipped sanatoria constructed by the insurance companies, where he is treated free of cost for an indefinite period. During the time that he is under treatment his wife and children are supported in every way by the company. The same companies also maintain dispensaries and day camps for the workingman and provide him with dental attention free of cost. All this is done, not out of philanthropy, but from a purely economic basis. The insurance companies have found it cheaper, as we have said, to treat and cure the tuberculous workingman and get him back to work and off their hands than to support him and his family during a much longer period of illness, if the disease is allowed to run on without timely treatment. How difficult it is to make communities realize this proved economic fact! They allow the poor consumptive to run on into a hopeless condition, and then they have to take care of him at public expense as long

as he lives, and at the same time care for his family. How much cheaper it would be to treat the consumptive at the right time, and in the right place, until he was well.

These German insurance companies for working people have at present a capital of five hundred millions of dollars, and in 1907 the German Workingman's Insurance Company had expended for the tuberculosis campaign $3,000,000. A further extension of this compulsory insurance is already determined upon, namely, the care of widows and orphans of workingmen.

There are some things that an enlightened monarchical form of government can do for its subjects better than the people in a democratic form of government can or will do for themselves, and, evidently, the compulsory insurance for workingmen would seem to be one.

Information Bureaus

In Berlin there have been established "Information Bureaus," as they are called, whose purpose it is to *prevent* the spread of pulmonary tuberculosis. At these bureaus, any one who desires it can have his lungs exam-

ined free of charge, and if tuberculosis is discovered, he is instructed as to the necessary measures to be taken to prevent the infection of others, and is cared for as his circumstances require. All the members of his family are required to present themselves for examination. The patient's home and family are kept under constant supervision, and proper sanitation is secured and the inmates trained to live hygienically. The striking feature of these bureaus is the constant watch maintained over the home and family of the consumptive, to prevent the spread of the disease from the sick member to others of his family.

Other Forms of Tuberculosis Work in Germany

The Germans have also developed many other forms of tuberculosis work, such as the park convalescent or day camps; forest schools for tuberculous children in the vicinity of large cities; vacation settlements; farm colonies for patients discharged from the sanatorium; sea-side hospitals for children with bone, joint or gland tuberculosis. In Berlin and elsewhere model, clean, well-ven-

tilated tenements have been erected in increasing numbers, and for this purpose large sums have been loaned by the state and the workingmen's insurance institutions. Besides the above special kinds of effort, there are also the various measures common to other countries, such as restriction of spitting, disinfection, compulsory notification, etc. It is said that Berlin has the best control of the tuberculosis situation of any city in Europe comparable to Boston and New York City in this country.

England

England comes next to Germany of European countries in its activity in the tuberculosis Crusade. Long before Koch's discovery, consumptive hospitals existed in London. The largest of them, the Brompton Hospital, was established in 1841, and its foundation happened in an interesting way: A consumptive clerk of Sir Philip Rose was rejected at several general hospitals, and learning of the fact, certain philanthropists determined to erect a special consumptive hospital; and the result was the great Brompton Hospital with between three hundred and four hundred beds. It is doubtless partly due at least to its consumptive hospitals that the death rate from

this disease is so low in London, one of the lowest in any large city, less than half that in Paris and Vienna.

There are also many sanatoria in England. One of the newest is the King Edward VII Sanatorium, costing $1,000,000, the gift of one man. There is a national association for the prevention of tuberculosis and many similar local associations. In 1901 a great International Congress on Tuberculosis was held in London. In Edinburgh Dr. Philip established the well-known Victoria Dispensary in 1887, one of the first and best of the kind in the world. In some English towns consumptives are received for temporary residence in isolation hospitals for educational purposes, in order that they may learn how best to live wholesome lives and how to deal with their sputum. The city of Birmingham was the first city to erect a municipal sanatorium for its consumptive sick; and it is interesting to recall the fact that near this city, sixty years ago, George Bodington erected his sanatorium for the open-air treatment of tuberculosis and received such opposition that he was obliged to abandon the scheme. The new sanatorium surely ought to be dedicated to his memory.

England is also doing much in an indirect way in the prevention of tuberculosis by its

excellent sanitary service, model tenements, better and cheaper food, decrease of alcoholism, and a general diminution of pauperism, all of which has played an important part in the steady decline of the death rate from tuberculosis which has been going on in England for many years. The English government has now established the "National Insurance Act" similar to the German "Compulsory Insurance law," and provided a capital sum of $7,500,000 for the erection of sanatoria for the entire community.

Ireland

In 1907 the Women's National Health Association of Ireland, under the leadership of the Countess of Aberdeen, inaugurated an aggressive campaign against tuberculosis, which is far more prevalent in that country than in England. If the death rate from tuberculosis in Ireland was reduced to that in England, it would mean the annual saving of 4,000 lives in the former country. By means of a traveling tuberculosis exhibition, accompanied by lectures upon the subject, public enthusiasm was aroused throughout the land. "Everywhere," says the report upon the movement, "the talk is of tuberculosis, fresh air, open windows; and the virtues of

the same are being discussed with vehemence in the clubs and public houses." In one place visited by the exhibition and the Countess, a number of people in the poor streets decided to show their welcome of the Countess by whitewashing their houses inside and out. "The bishops and clergy of all denominations, the landlords and tenants, the town and city officials, the town's people and the peasants, were all united in the desire to stamp out tuberculosis. In 1908 the Tuberculosis Prevention Act was passed, which gives power to county councils to establish sanatoria and dispensaries. In 1912 there were 17,000 fewer people suffering from tuberculosis in Ireland than there were in 1907.

France

In France, where there is a high mortality from tuberculosis there are comparatively few sanatoria for adults, but the main effort is directed to the prevention and treatment of tuberculosis in children. The authorities in this country consider that the infection generally takes place in childhood, and, therefore, the chief attention should be directed to preventing tuberculosis in the child, when it is exposed to the contagion in the home where

some member is suffering from the disease. There are probably more sanatoria for children in France than in all the other countries combined, and some of the largest and most famous sea-side sanatoria for children are situated in this country; and in all of them—twenty-four in number,—there are accommodations for about 4,000 children.

Further consideration of this work of the French with tuberculous children will be given in the chapter upon "Tuberculosis and the Child."

The system of dispensaries is very extensive in France, and at Lille Dr. Calmette established one of the first model dispensaries in Europe, which he called a "Preventorium," and which has become famous throughout the world. There are many anti-tuberculosis leagues throughout France, united in a national federation under the patronage of the president of the republic. In 1905 an International Tuberculosis Congress was held in Paris, under the auspices of the government. Instruction is also given in the schools regarding tuberculosis.

Sweden

In Sweden, which has a yearly mortality of about 10,000, there is a national tuberculosis

association, which carries on an educational propaganda by lectures, publications and a tuberculosis museum at Stockholm. It is interesting to learn that the chief source of income of this association is through the popular method of selling charity stamps, similar to the Red Cross stamps; and during the years 1905 to 1907 the amount obtained in this way was about $60,000.

Sanatoria have been established both by the general and local governments; and the former has appropriated $3,000,000 and land for the next ten years for this purpose. In 1895, at the Twenty-fifth Jubilee of the reign of King Oscar II, the national collection made to commemorate the event, amounting to over half a million dollars, was donated by him for the erection of public sanatoria, and this sum, together with a quarter million more voted by Parliament, was applied to the erection and maintenance of sanatoria in different parts of the kingdom. Dispensaries have also been established where milk and other food are distributed to needy consumptives.

An interesting experiment has been inaugurated in this country of establishing a house with a number of tenements, hygienically clean and wholesome, for families in which the father or mother, or both, were suffering

from tuberculosis but still able to work, the children being healthy. Such a house has a resident nurse, who pays a daily visit to every family and instructs them as to cleaning, ventilation, the proper care of the sputum, etc. Everything, though very simple, is kept hygienically clean. A somewhat similar experiment is now being carried out in the Vanderbilt East River Homes in New York City. A very important work is also being done with healthy children of consumptive parents. With the consent of the latter, the children are removed from their homes and the chances of infection, and boarded out in temporary homes or institutions. The public press of Sweden has also been very helpful in the tuberculosis Crusade.

Denmark

In the little country of Denmark, with a population of a little over two and a half millions, there is a national association which maintains five sanatoria for the poor, and a dispensary at Copenhagen. This association is also very active in the educational propaganda, disseminating literature and providing lectures for the public and for school children. It was also aided in the erection of other sanatoria in out-of-the-way islands,

THE VANDERBILT EAST RIVER HOMES.

as in the Faroe Islands, where there is a combined hospital and sanatorium.

The state and various societies maintain other sanatoria, consumptive hospitals, and sea-side hospitals and sanatoria for children, affording, in all, accommodations for 2,180 patients of the poorer classes, so that anyone who desires can obtain admission in some of these institutions. Among the public measures for combating tuberculosis are compulsory notification, compulsory disinfection after death from tuberculosis, prohibition of spitting, and the prohibiting of women suffering from tuberculosis from becoming wet nurses. Tuberculous children are prohibited from attending school and tuberculous teachers from teaching school. Before children begin to work in workshops or factories, a doctor's certificate must be produced, stating that they do not suffer from tuberculosis. Children living under such conditions in their homes as are injurious to their health, may be taken away from the parents and boarded out in good homes. No person suffering from tuberculosis of the lungs and throat is allowed to fill an office in the civil service that would bring him in close contact with the people. Another excellent provision requires that the floor of school rooms shall be washed

at least twice a month, and that the floor as well as the desks, etc., shall be wiped with a wet cloth every day after school hours while the premises are being aired.

Switzerland

In Switzerland whose yearly mortality from tuberculosis is 9,000, there are many so-called high-altitude resorts for tuberculosis which are visited by consumptives from various portions of Europe. Davos is best known and contains several sanatoria. Leysin, St. Moritz, Andermatt and Arosa are of similar climatic characteristics. There are a number of popular and private sanatoria with accommodation in all for 1,600 patients, and, in addition, several institutions for tuberculous children, and what are called holiday colonies for children and farm colonies for convalescent adults. As with the other countries, there are many tuberculosis associations in Switzerland, and in the canton of Bern the Grand Council has adopted extensive provision for the educational propaganda and the prevention of tuberculosis. Alcoholism is given as the most common predisposing cause of the disease in this country. It seems strange that a land like Switzerland, with such pure mountain air, should suf-

fer very much from tuberculosis, but here again the in-door life, fostered by the long, cold winter, is probably a powerful contributing cause, together with alcoholism, just mentioned.

Belgium

Belgium has a large and active National League against tuberculosis with over 6,000 members. It has established dispensaries, cares for consumptives, and expends in this work more than $50,000 annually. The dispensary system is elaborately developed in Belgium, after the plan of Calmette in France, and the name "Preventorium," which he originated, is applied to them. Sanatoria have also been established, the one in the province of Liege costing $240,000. The campaign against tuberculosis in the Belgian army has been vigorously pushed and strict measures have been adopted with regard to it. In the rooms of all military establishments are placards with the following inscriptions: "Do not spit on the floor: it is dirty and dangerous, as the tuberculous sputum, dried and reduced to dust, is the means of spreading consumption." Large

sums of money have been spent in the building and improvement of barracks, schools and hospitals.

Norway

Norway was the first country to pass laws requiring compulsory notification of tuberculosis, disinfection after death, or change of residence, and removal to a hospital if hygienic instruction were not carried out. So-called Nursing Homes were first established in this country, primarily for the purpose of isolating advanced and incurable cases. These homes, containing six to ten beds, are in charge of a nurse, and are plainly but comfortably constructed, and maintained at a small cost. As it is well known, leprosy has existed in Norway for centuries, but is now nearly extinct, owing to its being isolated. Funds devoted to this purpose ever since the Middle Ages have now been diverted to the care of tuberculous persons, and a leper hospital, no longer needed for its original purpose, has been changed to a sanatorium. May this same thing happen with regard to tuberculosis, and when that becomes extinct, the sanatoria converted to other uses. There are a

number of private sanatoria in Norway, and two marine ones for the treatment of surgical tuberculosis in children.

In the city of Bergen, where the Crusade has been energetically carried on, the mortality from tuberculosis has decreased about 50 per cent. within the last eleven years. It is a notable fact that the decrease is greatest in the cities.

Tuberculosis Work in Other Countries

In similar ways the great Crusade is in progress in Russia, Italy, Spain, Portugal, Roumania, Bulgaria, Bohemia, Turkey and Greece. Both the governments and the people are united in this great movement. By the invitation of the King of Italy the last International Tuberculosis Congress was held in Rome in 1912.

On the other side of the globe, Japan, Australia and New Zealand are actively engaged in this cause. On this side of the water many of the South America states, Mexico and Central America, have their anti-tuberculosis leagues, and have established dispensaries and sanatoria. Indeed, at the present time one could almost estimate the degree of civiliza-

tion of any country by the degree of its activity in the great Crusade against tuberculosis.

Canada and Brehmer Rest

In Canada, besides its tuberculosis association with its various affiliations and its public and private sanatoria, there is a most valuable and interesting institution at St. Agathe-des-Monts, in the Laurentian Mountains, called "Brehmer Rest," or the "Preventorium," where young workingwomen who do not have tuberculosis, but seem predisposed to it, such as convalescents from various acute diseases, shop girls, factory workers, typewriters, etc., are received and by rest, good food, and fresh air, restored to their normal health and resisting power and thus rescued from the possibility and, with many, the probability of developing active tuberculosis, thus admirably illustrating the fact that the best time to treat a disease is before it begins; and in weeks doing what later it would take months to accomplish, when active tuberculosis begins. If, as has been asserted by a good authority, from 50 to 90 per cent. of us all have had tuberculosis at some time, or will have

it before we die, though it may never become active, then the value of such a "Preventorium" is evident, for many of its inmates undoubtedly would, if left to go on in their depressed vital condition, develop active disease. The best means to avoid tuberculosis is to always keep one's self in a sound state of health, and, consequently, in a state of resistance to the tubercle bacilli; and when, for one reason or another, one's vitality gets low, the danger threatens, and this unique institution, the "Preventorium," is the helping hand which aids in warding it off.

The Tuberculosis Crusade in the United States

In the United States we find that the ratio of tuberculosis per 1,000 of the population is about that in England, and yet the campaign against the disease in the past has not been as active in this country as in the latter. Now, however, for several years past the country has been awakening, and increased effort is being made. The International Congress at Washington has undoubtedly had its influence in stimulating the states and people to greater activity. We have

as yet, unfortunately, no National Bureau of Health, as in Germany, to lead in such great movements as this one against tuberculosis. Civilization has not yet arrived at that stage when the protection of health is regarded as paramount to the protection of property. Neither does the general government appropriate any considerable sums for the prevention of disease in man, although it maintains a cattle bureau and, presumably, makes a liberal appropriation for this object.

The Price of a Battleship for the Tuberculosis Crusade

If only the price of one battleship could each year be devoted to the prevention of tuberculosis, how much could be accomplished; and if half of what is now appropriated for military purposes could be employed against this one disease, with what strides should we see it disappear! Since the year 1908 the amount of tuberculosis activity in this country has been steadily increasing and nearly twenty million dollars have been expended in the campaign of 1913. The State of New York appropriated nearly four million; Pennsylvania over a million and a

half; Massachusetts over a million; and about three millions was expended by fraternal organizations, labor unions and insurance companies. Since 1909 the percentage of public money spent in tuberculosis work has increased from 53.5 to nearly 70 per cent. What could have been accomplished if $10,000,000, the price of one battleship, had been available in addition! It has recently been proposed by Dr. Knopf of New York that the United States government should place at the disposal of the various states of the Union some of its discarded battleships and cruisers to be used for open-air schools, preventoria, and sanatorium schools for children, or hospital sanatoria for adults. The Italian government has done this with three of its discarded men-of-war.

What the United States Government is Doing

The tuberculosis work in the United States has been chiefly carried on by the people, through voluntary associations, and by the state governments. The United States government, however, has established sanatoria for its soldiers and sailors in Colorado and New Mexico, and has also promulgated rules

and regulations against indiscriminate spitting in all government buildings, such as the post offices and various government departments in Washington. In 1905, President Roosevelt issued orders for the purpose of preventing and eliminating tuberculosis among the employees in the public service. The sanitary condition of all public buildings and workshops was to be inspected and rules of prevention were required to be displayed. Any consumptive workman was to take special care not to infect others, and those suspected of having tuberculosis were to be examined at public expense.

The National Tuberculosis Association

Nine or ten years ago a National Association for the study and prevention of tuberculosis was founded, the chief function of which is educational. In carrying out this educational work, the association has sought to interest all classes of people to aid cities, towns, and states in organizing tuberculosis associations, in procuring special legislation in the interests of tuberculosis prevention and care and in disseminating knowledge regarding the many means and methods of fighting tuberculosis, and in collecting statistics upon

the many phases and movements of the tuberculosis crusade. There are now in this country over twelve hundred tuberculosis associations. Sanatoria and dispensaries have also been rapidly multiplying and there are now 527 special tuberculosis sanatoria and hospitals and 395 tuberculosis dispensaries, and their number is almost daily increasing.

The Red Cross Stamps

By means of the Red Cross stamps or seals, 40,000,000 of which were sold last Christmas, not only has a very considerable amount of money been raised for the cause, but they have proved one of the greatest mediums of education. These stamps are widely advertised by colored posters and cards placed in store windows, stations of the subway and elevated roads, and posted about the city. On a poster, among other things, was the following in large letters: "Every stamp means a bullet in the fight against tuberculosis." The stamps were for sale in many of the leading department stores, confectionery stores, stationers, etc. In Chicago, the post office gave the tuberculosis institute a booth which was attended by a body of nurses from the hospitals. The following was written in praise of the virtue of the stamp:

"I'm the Red Cross Christmas Stamp.
This that I propose is,
To summon wealth to fight for health
And beat tuberculosis,—
Beat the greatest plague of all,
Oust a pall of sadness,
Treat despair with food and air
And lift it into gladness."

The Clergy and Churches and Societies

The labor unions have entered into the campaign with great zeal and activity, and the churches and clergymen all over the country are uniting in preaching the great Crusade. Churches are forming and maintaining tuberculosis classes, and clergymen are preaching sermons on tuberculosis. Every year a certain Sunday is designated as "Tuberculosis Day." In 1912 over 60,000 churches gave attention to this subject on "Tuberculosis Day." In the Roman Catholic Church the clergy are instructing their congregations upon tuberculosis, and the subject is being taught in the parochial schools. Thus a million and a quarter school children and seventeen million Catholics in the United States are being reached. The Young Men's Christian Association, the Christian Endeavor So-

cieties, the women's clubs and many civic and social societies are all interested in the campaign and are learning and preaching the gospel of the prevention of tuberculosis and its cure by fresh air, rest, and wholesome food. Besides its great educational propaganda, the National Association is continually investigating the various problems connected with tuberculosis, such as the cost and best methods of the construction of sanatoria, tuberculosis among children, and many other problems.

Governors and Legislatures

It is a significant fact to notice the attention now devoted in the various states by governors and legislatures to the subject of tuberculosis. In 1913 out of 41 state legislatures in session, laws dealing with tuberculosis were enacted in 30 states. In their messages, governors urge upon the legislatures the importance of taking some action against tuberculosis. Said the Governor of West Virginia in a message to his legislature: "Prevention will, to an extent, include the care of those who are afflicted and who cannot take care of themselves, in order to guard against the danger of their infecting others. One

consumptive person may infect hundreds of others, for he will grow and emit millions of the diseased germs. Hospitals or like places where such persons may be isolated and treated is a necessary part of any reasonably effective campaign against the dreaded disease. That it would be a noble charity goes without saying. I recommend to the legislature the earnest consideration of the pressing matter of promoting the public health, especially as concerns the safe-guarding of the people against the awful ravages of consumption." "For every dollar we spend in getting rid of this scourge" (tuberculosis), said Governor Hughes in a recent address, "we should save a hundred dollars in increased productivity and efficiency."

New York

Of the individual states, perhaps New York, Massachusetts, Pennsylvania and Wisconsin are the leaders in the Crusade, although many others are closely following them. We have already seen what New York City has done in compulsory registration, disinfection, and in the provision for its tuberculosis inhabitants in sanatoria, hospitals and dispensaries. The first sanatorium in this country was established by Dr. Trudeau in

the Adirondacks in New York State, and is a monument to his devotion to the cause. At Coney Island is a sea-side sanatorium for tuberculous children.

Pennsylvania

In Pennsylvania a society for the prevention of tuberculosis has existed since 1892. In Philadelphia is the great Henry Phipps Institute recently erected for the study, treatment and prevention of tuberculosis, established and maintained by a gift of $1,000,000 by the philanthropist whose name it bears. Both a hospital for advanced cases and a dispensary are maintained by this institute and much attention is devoted to the study of tuberculosis in all its phases.

Delaware is the only state which has made provision for a state sanatorium for tuberculous negroes.

Massachusetts

Massachusetts erected the first state sanatorium in the country, and it affords accommodations for 350 patients. This same state has also established three other sanatoria for early and advanced cases of tuberculosis. The first day camp in the United States had its origin near Boston, and in the same city one of the first hospital schools for tubercu-

lous children was instituted. By an act of the legislature, fifteen state inspectors of health were appointed who are physicians, and as a part of their duties they are required to "gather all information possible concerning the prevalence of tuberculosis and other diseases dangerous to the public health in their respective districts." Laws have been enacted requiring the establishment of local hospitals and dispensaries for tuberculosis throughout the state. Thus it will be seen that the people of the United States are "arming from East to West" for the fight against the "Great White Plague."

Scientific Activity in the Study of Tuberculosis

Besides all the active, practical work now in progress for the prevention and treatment of tuberculosis, an immense amount of study is being devoted to tuberculosis and the many yet unsolved problems in regard to it. In laboratories, in sanatoria and hospitals patient investigators are at work striving to gain more light upon this great subject; and their investigations are sure to result in added and new methods of fighting the disease. The late Prof. Koch, with his band of assistants, in his laboratory at Berlin, devoted much of

his life to the study of this disease. One might mention scores of names of illustrious men the world over, who, in the seclusion of the laboratory or in the clinics of the sanatoria and hospitals, are investigating tuberculosis problems. To mention a few, we have Behring and Flügge in Germany; Prof. Landouzy and Calmette in France; Newsholme, Latham and Ransome in England; Phillip in Scotland; Trudeau, Baldwin and Theobold Smith in America; Kitasato in Japan; Maragliano in Italy.

It was Flügge of Germany who first demonstrated that particles of sputum thrown out in coughing contained the tubercle bacilli, and Theobald Smith of Boston who discovered the difference between the bacillus of cattle and the human bacillus. Trudeau has for years been studying the conditions of immunity to tuberculosis and striving to obtain a serum or some form of tuberculin which might produce an artificial immunity in man. Much still remains to be learned about tuberculosis, for "Science moves but slowly, slowly creeping on from point to point." Still we can only be profoundly grateful that we know enough to intelligently carry on the Crusade, for we know that tuberculosis is preventable and curable, and we know how this is done.

Effect of the Tuberculosis Crusade

This great Tuberculosis Crusade has indirectly been of the highest value in stimulating the people to increased effort in the improvement of the general conditions of living. Undoubtedly many of the measures for protecting and uplifting the health of the masses, such as the tenement house reforms, factory inspection, the provision of more play grounds, laws against child labor, and many others, are largely due to the tuberculosis campaign, for it has been this Crusade which has demonstrated to the world the inestimable value of cleanliness and fresh air.

It is evident from the present world-wide Crusade that there is a determination to fight tuberculosis to the death. From the constant increase of all the instrumentalities we have been considering, it is apparent that this great movement is daily gaining in momentum and power. The great awakening is at hand; and from every indication it seems destined to grow and grow until the final consummation is achieved and the "Captain of the men of Death," the Great White Plague, is exterminated.

XII. TUBERCULOSIS AND THE CHILD

"THE fight against tuberculosis," says Prof. Pannwitz of Berlin, "is in the last analysis an education of the people in social hygiene, and every kind of education should begin in childhood." "Whatever we do for the children is for the good of future generations," for, as the poet Wordsworth has so well expressed it, "the child is father of the man." It is, therefore, of the highest importance to protect the child from exposure to tuberculosis, and when it exists, to afford it every opportunity for treatment and recovery.

Of late years, especial study has been devoted to tuberculosis in children, for, as evidence has accumulated, it has been found that the disease is much more frequent in childhood, than was formerly supposed, and that the frequency of its occurrence increases with the age, the greatest frequency being between five and fifteen years of age; and during the

first years of life it is markedly more prevalent among girls than boys.

A large number of autopsies made upon children dying in hospitals shows a very considerable amount of tuberculosis, not always tuberculosis of the lungs, but, what is common in children, tuberculosis of the glands or other parts of the body. In brief, it may be said that autopsy statistics have shown that tuberculous infection is found in about 40 per cent. of all children dying under fifteen years of age.

With the more accurate and newer methods of examination, it has also been found that tuberculosis is far more frequent in living children, as we have said, than was previously suspected, or than the death rate would indicate. Various observers have found in the examination of school children that from 29 to 40 per cent., or more, gave evidence of tuberculosis. Thus, in Paris, 40 per cent. of school children examined showed signs of the disease; and in the examination of 2,295 children in New York by Dr. Williams, 29 per cent. showed tuberculosis of the lungs, while Philip of Edinburgh found that among groups of children examined in the various public schools of that city 30 per cent. gave evidence of tuberculosis. Dr. William C. White of

Pittsburg states that 90 per cent. of all school children in our large cities have tubercle bacilli in their system before reaching the age of 19 years.

Latent tuberculosis, that which is not active and produces no symptoms, has been demonstrated by Hamburger, a German authority, to be present in 71 per cent. of children from 7 to 10 years, and from 11 to 14 years in 94 per cent.

Many good authorities, particularly the French and some Germans, believe that most cases of tuberculosis become infected in early life—in childhood, as the figures first cited appear to show—and that during this period the disease remains inactive or latent, that is, showing no symptoms. When the child, however, undergoes the stress and strain of study and confinement in school, or in adult life enters into the struggle of earning a livelihood, with all the coincident depressing influences upon the health, the tuberculous infection, before latent, becomes active, and tuberculosis in some form develops. "The harvest of tuberculous disease in mature life," says Dr. Kelynack, "is oftentimes dependent on a tuberculous seed-sowing in early days." "Tuberculosis in early life," he continues, "is responsible for many far-reaching disabilities,

and not a few of life's long-postponed disasters."

How Children Contract Tuberculosis

If so large a proportion of children as the above evidence indicates have tuberculosis in some form, the natural inquiry is, How did they contract it? In the first place, children are much more susceptible to infection of any kind than adults. We speak of the common, acute, infectious diseases, such as measles, whooping cough, scarlet fever, etc., as children's diseases, for children contract them more frequently and readily than adults. The same thing is true with regard to tuberculosis. Children are much more susceptible to it than adults. Moreover, children cannot resist unhygienic conditions of living, impure air and confinement in-doors as well as their elders. Added to this, a case of tuberculosis in the home, and we have the conjunction of the favorable soil and the seed. It is probable, then, that very many cases of tuberculosis in children arise in a consumptive home, and the fact that so many cases of the disease are discovered in children from such homes is evidence of the truth of this. Some cases are undoubtedly contracted from other school children and occasionally from a tuberculous teacher.

With regard to the channels through which the infection takes place, whether by inhalation—breathing in the germs—or through the intestinal tract by means of infected or contaminated food, is still a question upon which there is a wide difference of opinion. This practically does not make very much difference, however, for the method of prevention is the same, as we shall presently see.

Milk Infection

There is another view of the cause of so much tuberculosis among children, and Behring, whom we have mentioned before, the great German investigator of contagious diseases and who discovered the antitoxin of diphtheria, is the most ardent supporter of this view. It is that milk infection is the cause, and that tuberculosis of adults, as he says, "is only the concluding chord of the infant's cradle song." Behring based this view upon his experiments with animals, in which he found that young animals were almost always infected by the food. Milk containing the bovine bacilli may infect children, but that it frequently does, we have not sufficient proof, and much evidence against this theory. For example, in Japan, where there are no cattle, milk is never used as infants' food, but tuber-

culosis is just as frequent as in countries where milk is used; and in Constantinople, where the mothers invariably nurse their children, tuberculosis is very prevalent. Nansen, and other writers upon the Esquimaux in Greenland, testify to the great prevalence of tuberculosis among them, and here again the mothers invariably nurse their children for a long period. We have also the statement of the great authority, Koch, that the cattle bacillus is different from the human bacillus, and that the former is rarely found in human beings suffering from tuberculosis. He therefore does not believe that milk is a frequent cause of tuberculosis in children. "Tuberculosis of the bones, joints, glands, and intestinal tuberculosis, however, so frequent in children, is attributed by many authorities to the bovine bacillus carried in milk." We should therefore use every means to safeguard the milk in this present uncertain state of our knowledge upon this subject by assuring ourselves that it comes from healthy cows, or by sterilizing it.

House Infection

We must, then, regard the chief cause of pulmonary tuberculosis, at least in children, as house infection, and a child in a home where

there is a case of tuberculosis, particularly when it begins to creep and handle things and puts them in its mouth, as babies constantly do, or breathes infected dust, has abundant opportunity to become infected. The kind of tuberculosis which we have spoken of before as "closed tuberculosis," by which we mean that the tubercle bacilli are not thrown off from the body, and, consequently, no infection of others can take place, is the most common kind in children. In this class can also be included tuberculosis of the bones, glands, hip disease, scrofula, and intestinal tuberculosis, all of which are frequent in children.

From this fact, that the "closed tuberculosis" is the most common form in children, we see the great advantage of treating and curing it while it is in this stage and non-infectious, for thus we kill two birds with one stone: we save the child and avoid the danger of communicating the disease to others if the case was allowed to go on and later become "open," that is, with tubercle bacilli in the sputum.

Tuberculosis Not Decreasing in Children

While tuberculosis has been decreasing more or less rapidly among adults, it has not done so with children. Thus, in Germany,

while the mortality rate has been progressively decreasing during the years of active adult life, the same result has not occurred, or only to a very small extent, with children. On the contrary, at the ages of from five to ten years and from ten to fifteen years, tuberculosis has increased. Evidently the modern anti-tuberculosis measures have been devoted more especially to adult life than to children; but now the tide seems to be turning and children are receiving more attention. France, however, as we have seen, has always recognized the primary importance of attention to tuberculous children and those predisposed to the disease, and hence the main efforts in the tuberculosis crusade in France have been directed to the care and cure of such children.

In order effectively to carry out the tuberculosis work with children, we must begin with the mothers, and children in the home, and then with the children in the schools. Nursing mothers must be protected and afforded time and opportunity for properly caring for their infants and themselves. In France there are Mothers' Help Societies, which, in various ways, aid in securing care and rest for young mothers: and milk dispensaries, called "créches," which consist of a

hall or ward in a working district where working mothers can go and nurse their children without interfering with their work. In Italy and Portugal the law requires the establishment of such créches in every factory where women are employed. For women who are unable to nurse their children, sterilized or pasteurized milk is furnished in the French créches.

In this country there has recently been established near New York, through the beneficent gift of Mr. George H. F. Schrader, a home and school for mothers called "Caroline Rest," where poor women, worn-out with factory work and household duties, can go and rest after the birth of their children. The home accommodates thirty mothers and twice as many babies and young children. There is also connected with this home a corps of "Caroline Rest" nurses who visit the mothers in their homes before the birth of their children and instruct them in personal hygiene. While the mothers are at the home, they receive instruction in infant and personal hygiene, cooking, etc.

Children in Infected Homes

In dealing with the problem of children

of tuberculous parents in the home where the surroundings are favorable for the transmission of the disease, we must either do what we can to protect the child while it remains at home or remove it from its dangerous surroundings. That the danger of contracting the disease by the child is great in such homes has been shown by Dr. Sachs of Chicago, who found, in the examination of such children, that 28 per cent. between five and ten years of age, and 25 per cent. between ten and fourteen, gave evidence of tuberculosis.

In France Prof. Grancher established the "League for the Preservation of Children from Tuberculosis," the main object of which is to remove children of tuberculous parents from their homes, where they are daily exposed to infection, and to send them into the country. In his appeal Prof. Grancher said that he had for a long time been haunted by the leading idea of Pasteur's book on "Diseases of the Silk Worms," that in order to save a race that is threatened by an infectious disease, the best plan is to save the cocoon. Children taken from tuberculous homes are boarded in the country with the farmers or

rural families, and in addition there are rural colonies where poor illy-developed children from tuberculous homes are afforded a long stay in the country or by the sea-side; and holiday colonies for school children during their vacation.

In Germany there are also many vacation colonies for delicate children, located either among the extensive forests which surround many of the large German cities, or in the open country, or on the sea-coast. The Berlin Society for Vacation Colonies has assisted in this way over 70,000 children. In Sweden, as we have seen, healthy children from consumptive families have been removed and boarded out, and two children's homes have been established, with fifty beds, where the children are kept until suitable families are found with whom they can be placed. In Denmark, Switzerland and, indeed, in most countries at the present time, vacation or holiday colonies exist for weak or sickly children. If it were possible to do so, the only sure method of safeguarding the children of tuberculous parents would be their removal from such homes, and placing them in the country under wholesome hygienic conditions.

A Tuberculous Mother Should Not Nurse Her Infant

In the case of the infant of a mother with active tuberculosis, under no conditions should the latter nurse her child or have it with her, for the obvious chances of infection are great, not, however, through the mother's milk, but through the intimate association of the child with its mother. If removed from its tuberculous mother at once, there is strong hope that the child will grow up well and healthy, if reared under good hygienic conditions, in pure air; for we may repeat again that tuberculosis is not inherited, and whatever tendency may be inherited can be, to a great extent if not entirely, overcome by a proper environment.

Feeding School Children

Another means of prophylaxis is the provision for poor underfed school children of nutritious food by the school or public authorities. This is done in many countries, but especially in Germany and France. In many of the German cities soup seems to be the usual food furnished. Thus, for example, in Strassburg, 2,800 pint bowls of soup are daily

distributed to the local schools. In other places milk is furnished. In Dresden, since 1896, there has existed a special association for feeding poor school children with substantial food. Supplying free meals to children is not regarded in Germany as coming under the head of public charity. This is now done in many schools in this country.

How to Treat Children with Tuberculosis

If a child is discovered to have tuberculosis, its disposition will depend upon the state of the disease, whether it is " closed " or " open." If the latter, sanatorium treatment should be provided, and this is done in many countries, notably in France and Germany. In the former country there are about 4,000 beds available in the country or sea-side. In the sea-side sanatoria, children suffering from bone, joint and gland disease are treated. In Germany there are eighteen sanatoria with 900 beds for tuberculous children, and seventy-three institutions for suspicious cases and those suffering from scrofula. In the United States, sanatoria for tuberculous children with " open " tuberculosis are, as yet, but few and many more are needed. Mention

has already been made of the Sea Breeze Hospital at Coney Island for children with bone, joint and gland tuberculosis.

If the child has "closed" tuberculosis, or is predisposed, as we say, to tuberculosis, it can under certain conditions attend school, and thus at the same time continue its education and take the treatment. These conditions are fulfilled by the open-air school, which is what its name indicates. If the child undertakes the ordinary school routine, it is likely sooner or later to break down under it, and thus, from an economic standpoint, the money expended by the public for its education is lost. In Illinois it has been shown that the state expends annually $1,187,000.00 in the education of the children who die of tuberculosis before their twentieth year. The open-air school is established in some open-air space, or park, near the city, and the children are either directly out-of-doors, or in the colder months of the year and in stormy weather have some shelter. They are warmly clad with thick clothing appropriate for out-door life, are well fed and have periods of rest during the day.

A Typical Out-Door School

For the out-door school in Boston, the unused portion of a large building in Franklin Park was utilized. A sunny room for the kitchen and dining-room, a rest-room, lavatories, and a school-room for stormy weather were provided. Upon the spacious roof with its pergola, a tent was placed for the children's desks, which was the school-room in ordinary weather, canvas curtains being provided for high winds. The stormy weather room was rarely, if ever, used. Each child had a bag of waterproof canvas lined with blanketing, fitted about the legs and up over the back. In addition, everyone had a thick ulster overcoat, warm cap and mittens, woolen stockings and arctic overshoes. The home conditions were carefully supervised by a nurse, who also took the children to dental, eye, ear, nose or throat clinics for examination or treatment. A director and cook trained the children in home hygiene and economics, and the director had general oversight of their welfare. The children were given three meals each day of nutritious food. The school board provided the teachers and car fares. The daily

routine was as follows: On arriving at the school in the morning, the children had breakfast and then some attended to their exercises in the class-room, while others, for a short time, worked in the kitchen and dining-room. During the forenoon, there were school exercises with a recess, breathing exercises, play and preparation for dinner. For an hour after dinner, all the children rested in their sleeping chairs. The afternoon was passed as in the forenoon, and after supper they returned to their homes. One of the scholars, when asked to give the reason why he liked the open-air school, wrote: "I like the open-air school because I have grown stronger and healthier, also because I have gained six pounds."

The number of children in this school was twenty-one, from eighteen families, whose average number of inmates was six, living in apartments averaging four rooms. There were thirty-seven tuberculous persons in these families, an average of two to each family. Thirty-one children had been at the school a month or more, and sixteen were returned to ordinary schools as arrested cases.

Experience has demonstrated, as the results

AN OPEN-AIR SCHOOL ROOM IN BOSTON.

in the Boston school show, that many of these children fully regain their health, and are enabled to return to the ordinary schools. There are now in this country nearly 200 open-air schools.

Of course this open-air school for many children only partially solves the problem, for they have to spend the night at home, often under very unhygienic conditions. For children thus situated, the only solution is residential open-air school colonies.

Another important preventive measure with children is the care and protection of their teeth, which has before been referred to. When it is remembered that a large portion of school children have decayed teeth so that they cannot properly chew their food, the importance of this prophylactic measure is evident. Again, in this connection, it is well to refer to enlarged tonsils and adenoids, so common in children, and which interfere with full, free respiration. Children found to be habitually breathing through the mouth should be examined for these conditions, and if they are found to exist, proper measures should be taken to remedy them.

Hygienic School Buildings

In the ordinary school buildings there is often much to be desired in the provision of sufficient space, proper ventilation, light and cleanliness, and sanitary arrangements. Every school building should be supplied with the bubbling drinking fountains, now generally used, in place of the dirty common drinking cup, and every schoolhouse should have an open-air room where weak and anæmic children could receive the benefits of the open-air system. Children should be taught to keep clean, and avoid putting dirty things in their mouths. Above all, the school-room should be frequently and thoroughly cleaned, and kept clean and free from dust, and an occasional regular disinfection would destroy many a lurking germ. The provision of play-grounds for children now being so actively promoted in the United States, both by legislation, as in Massachusetts, and by voluntary associations, is another evident means of improving the health of the child, and hence a valuable preventive measure against tuberculosis. Other preventive means are children's gardens, school farm leagues, the provision of swimming schools, or tanks for school children, as in Brookline, Mass., gymnastics, breathing ex-

ercises, frequent excursions into the country; and all the various instrumentalities for improving the child's health and giving him fresh air. The elements of hygiene are now almost universally taught in the schools, and, in addition, simple facts regarding tuberculosis. In a little pamphlet arranged for school children, called "The True Story of Tuberculosis," the following useful rules are given:

Rules for Children

1. Do not spit.
2. Do not let others spit.
3. If you have a cough, and must spit, use a paper napkin or a piece of newspaper, and put it in the stove.
4. Get plenty of fresh air; keep your windows open at night, no matter what the weather may be.
5. Do not allow anyone to kiss you on the lips.
6. Do not stay near anyone who has a cough.
7. Take a warm bath once or twice a week, and bathe your face, neck, chest and arms with cold water every morning.

8. Always hold a handkerchief over your mouth and nose, when you cough or sneeze.

9. Always breathe through your nose. If it is stopped up, and you have to open your mouth to breathe, go to a doctor or dispensary. You cannot be well unless you breathe through your nose.

10. Do not wrap heavy mufflers or furs around your neck.

11. Use your toothbrush after each meal.

12. Wash your hands with soap and water before each meal.

13. Never eat too much.

14. Drink all the milk you can get, and very little tea or coffee.

15. Do not lie on the bed with a sick person.

16. Avoid children who have any contagious disease.

17. Do not spit on your slate, or put your fingers in your mouth, before you turn the pages of a book.

18. Do not put things in your mouth that other children have had in theirs, such as whistles, spit blowers, chewing gum and pencils. Do not bite from the same apple that some one else has been eating.

AN OPEN-AIR SCHOOL IN PHILADELPHIA.

19. And last as well as first, DO NOT SPIT.

Teachers and Tuberculosis

Teachers are said to suffer heavily from tuberculosis, and Prof. Brouardel states that one-fifth of the teachers of Paris are tuberculous. Although teachers in other countries probably do not suffer from tuberculosis to this extent, still there is sufficient reason to require the periodic examination of all public school teachers, and particularly on entering upon their work, as is done in Denmark, where every teacher, on appointment to a public school, is obliged to present a medical certificate, not more than three months old, stating that he (or she) is not affected by any contagious form of tuberculosis of the lungs or throat.

The medical inspection of schools is now general, but this does not always include the examination of the children as regards tuberculosis. From what we have learned of the prevalence of tuberculosis among children, it would seem that such an examination, as serious an undertaking as it would be, should, at least once a year, be done.

The Home and Tuberculosis

After all, it is in the home where there is a case of tuberculosis that the greatest danger to the child exists, and it is where our strenuous efforts must be made. Dr. Lowman of Cleveland states the fact that of 504 children examined by him, who were from homes where there was a case of tuberculosis, thirty-eight had positive tuberculosis and sixty-four could easily become so infected under unfavorable conditions. From the standpoint of the child, the value of the visiting nurse in connection with the dispensary, of which we have before spoken, becomes more apparent, for whenever a case of tuberculosis is discovered, the nurse visits the home and urges all the children to be examined. And, again, the measures taken by the Information Bureaus in Germany, which have been described, in the protection of other members of the family in a tuberculous household, are shown in this connection to be of the highest importance in safeguarding the child.

A Complete Programme

Finally, in order to prevent and control tu-

berculosis in children and during school age, we must first: Know what children are infected and those who live in families where there is a case of tuberculosis. This can be done, in part, through the visiting nurse of the dispensary or through whatever agency is employed to investigate the home of the consumptive, and in a more complete, and the only satisfactory way, by a periodic examination of the lungs of all school children. Second: All children who are found to have "open," contagious, tuberculosis must be placed in sanatoria or hospitals, or receive treatment and care in the country similar to sanatorium treatment. Third: "Closed," non-contagious cases should be placed in open-air schools, and, during the summer, in vacation colonies or children's camps; or, where the home conditions are bad, in residential open-air schools or colonies. Fourth: Healthy children in families where there is a case of tuberculosis should either be removed from the family or kept under careful observation, or the consumptive member of the family should be removed. Fifth: All weak, sickly school children who could easily become tuberculous under unfavorable conditions should be placed

in separate rooms or schools where they can receive special hygienic attention, such as frequent intermissions for rest, shorter hours, food, and an abundance of fresh air. Sixth: The children of consumptive mothers should not be nursed by them, and should not remain with them. Seventh: All school teachers should have their lungs periodically examined. Eighth: School buildings should be so constructed as to be thoroughly ventilated and at all times have pure, fresh air and be kept absolutely clean. In every school building there should be one so-called open-air room. Ninth: School children should be instructed in the elements of hygiene and cleanliness, and the simple facts of tuberculosis and its prevention. Tenth: Children suffering from bone, joint or gland tuberculosis should be sent to sea-side sanatoria.

The above may appear to be a programme of perfection and too extensive for any community to undertake, but no labor or expense is too great in the protection of the child from tuberculosis, from which, as we have seen, it suffers so severely. What can appeal more strongly to the sympathy and interest of any anyone than the protection of the in-

By courtesy of Elizabeth McCormick Fund.

REST HOUR IN AN OPEN-AIR SCHOOL.

nocent, helpless child? Moreover, it is an economic gain to the community to save the child for future usefulness and contributions to the community, rather than to expend large sums upon its care when, later, active tuberculosis has developed.

"The field in which the decisive battle of our future campaign against tuberculosis must be fought, is the home," says Dr. Woods Hutchinson. "Our chief enemy, infection in early childhood." Both from an economic, a selfish, and a sentimental point of view, the most strenuous efforts should be devoted to the prevention and arrest of tuberculosis in children, for the child of to-day is the man of to-morrow, and has infinite and untold possibilities.

XIII. THE GOVERNMENT AND TUBERCULOSIS

IN the evolution of popular government, the first step is to render life safe and afford protection to property—to maintain law and order—for no progress and advancement in civilization can ensue unless a man is made to feel that he can pursue his avocation unmolested and remain secure in the possession of that which he has gained by his labor. As governments have developed, however, they have assumed many other functions with the object of increasing the welfare and happiness of the people, which a general government, with all its power and resources, can best or only accomplish. Thus, for example, the general government has provided or aided in intercommunication between the states and foreign countries by means of the post office and appropriations for the building of pathways of communication in

one way or another. Again, the general government has aided the people in the cultivation of the soil by agricultural laboratories, experimental stations, and the free distribution of seeds. The government is now reclaiming the desert wastes of the West on a vast scale by means of irrigation, and then returning the watered and fertile fields to the people for their cultivation. It is protecting the forests and coal fields, investigating cattle diseases, and in very many other ways doing for the people those things which they could not do, or only with great difficulty and slowly do for themselves, and which promote the progress and well-being of the whole country. Likewise states follow in the footsteps of the general government and perform similar offices for their people. Cities, again, provide public libraries, parks, baths and playgrounds for their constituencies.

Thus, it is recognized by modern governments that whatever adds to the efficiency, welfare and happiness of the people, and which they individually cannot do for themselves, may be properly assumed by the people collectively, that is, by the government, national, state or city.

The Government Should Protect the Health of the People

The realization that the government could promote the welfare of the people by provisions for the protection of their health seems to have come more slowly, and most of the steps which have been taken for this purpose by the general government have been of comparatively recent date, as, for example, the pure food law so recently enacted, and laws prohibiting or restricting child labor. It is obvious that if we would efficiently protect life and property, to say nothing of adding to the welfare and happiness of the people, the government must aid in protecting them from preventable diseases which unnecessarily destroy life and entail, through sickness and untimely death, great financial loss. This is especially true of such a prevalent and widespread disease as tuberculosis. The people cannot individually and unaided successfully contend with such a gigantic task as eradicating this Great White Plague. Private and voluntary effort must be supplemented by governmental aid, either from the general government or state intervention. The latter—the state—as we have seen, is realizing

its duty in this respect far better than the general government.

In most of the European governments, as has been already shown, the tuberculosis Crusade is aided both by official sanction and public appropriations for sanatoria, hospitals, and the educational propaganda. In the United States we have the great army and navy departments with huge annual appropriations of millions of dollars for the protection of the life and property of the people at home and abroad. We have the Department of Commerce and Labor to promote their commercial and industrial welfare; the Department of Agriculture to aid and show the farmer how he can, to the greatest advantage, till his soil and produce the crops best adapted to his land.

But, unfortunately, we have no specific Bureau of Public Health to investigate matters connected with the health of the people, to advocate and carry out measures calculated to protect the people's health, or to control prevalent diseases.

What Former President Roosevelt Says

In his last message to Congress, President

Roosevelt said: "The recent International Congress on Tuberculosis has made us painfully aware of the inadequacy of American public health legislation. This nation cannot afford to lag behind in this world-wide battle now being waged by all civilized people with the microscopic foes of mankind, nor ought we longer to ignore the reproach that this government takes more pains to protect the lives of hogs and cattle than of human beings." Under a National Bureau of Health, very many of the yet unsettled questions regarding tuberculosis could properly be investigated in government laboratories and the results practically applied for the benefit of all people. The work such a National Bureau of Health could do in stamping out tuberculosis is almost incalculable, and if but a small fraction of the money now appropriated for the army and navy should be devoted to this purpose, we should see the disease diminish with ever-increasing rapidity.

State Governments and Tuberculosis

With but few, if any, exceptions, the various states, as we have seen, have actively entered into the tuberculosis campaign, both by

the enactments of anti-tuberculosis laws and the appropriation of money for sanatoria and other purposes. Nevada, Utah, Wyoming and Mississippi are the only states which have made no sanatorium or hospital provision for consumptives. Only a few years ago, Pennsylvania appropriated one million dollars for dispensaries, sanatoria and the study of tuberculosis. The act of the legislature making this provision shows such a broad and comprehensive grasp of the subject that it is well worth while quoting as a model for other state governments. The amount appropriated was divided into two sums: One of $600,000, "to provide for the establishment and maintenance of one or more separate sanatoria or colonies in Pennsylvania for the free care and treatment of indigent persons suffering from tuberculosis and making an appropriation therefor," and the other part of $400,000, "to enable the department of health to establish and maintain, at such places in the state as may be deemed necessary, dispensaries for the free treatment of indigent persons affected with tuberculosis, for the dissemination of knowledge relating to the prevention and cure of tuberculosis, for the study of social and occupational con-

ditions that predispose to its development, and for continuing research experiments for the establishment of possible immunity and cure of said disease."

Probably, as Dr. Farrand thinks, the most efficient work of the states can be done through their boards of health, which, for the state, correspond to a National Bureau of Health. State boards of health have laboratories for the free examination of sputum; they disseminate tuberculosis literature; they investigate the tuberculosis conditions in their states, and, through them, laws passed by the legislature are put into execution. It is an encouraging sign to know that the expenditures of many state boards of health for health purposes have rapidly increased within the last ten to fifteen years, whereas, a hundred years ago, neither nation nor state spent one cent for the protection of health. Thus, in Pennsylvania, for example, up to 1904, the annual appropriation was only $6,500, while for the two years of 1906 and 1907 it was $2,100,600, and in 1913, it was $1,629,195 for tuberculosis alone. In Massachusetts, in 1895, the State Board of Health expended $56,876, and in 1913, $1,138,521 for tuberculosis besides the expenditure for other preventable diseases.

Fighting one preventable disease stimulates the health boards and the people to fight other preventable diseases, and to generally raise the standard of health requirements. The tuberculosis warfare has given an immense impetus towards the improvement of health conditions in general.

A Comprehensive Scheme for the State

Some states have especial tuberculosis commissions for the purpose of studying the prevalence and conditions of the disease within their own borders, instructing the people with regard to the same, suggesting the best means of combating it, and constructing sanatoria.

Whether it is done by such a commission, or by the State Board of Health, a comprehensive scheme adapted to the needs of the state should be arranged, with a fixed yearly appropriation, so that a systematic and continued warfare can be vigorously pushed. Such larger undertakings as the erection of sanatoria for early cases and consumptive hospitals for advanced cases, which are beyond the means of voluntary and individual effort, would naturally fall within the field of public provision.

What is most urgently needed at the pres-

ent time is greater and more adequate provision by the state for the isolation of advanced cases. Nothing will so surely and steadily reduce this prevalence of tuberculosis, as we have seen, as such provision for hopeless cases, and many states and localities are now doing this.

City Governments

The cities in their official capacity have, and are, doing more or less in the tuberculosis warfare. New York City is, perhaps, the most conspicuous example of a city possessing a complete programme for fighting the disease, and its efforts have been made through the initiative and continued aggressiveness of its very competent Health Department. It was the first city in the country to pass a notification law. It has established its own sanatorium, and provides extensive accommodations for advanced cases. It maintains 15 tuberculosis dispensaries, requires adequate disinfection of premises which have been occupied by a consumptive, and carries on very many other administrative schemes for the prevention and care of tuberculosis. "At the present time," says Dr. Biggs, the medical officer of the Department of Health,

" there is no other city in the world in which the health authorities have so thoroughly organized the tuberculosis campaign as in the city of New York." That this campaign has been effective is shown by the fact that the mortality from tuberculosis has been reduced more than 53 per cent. since the Department of Health undertook fighting tuberculosis twenty-five years ago. Other cities have followed the admirable example of New York to a greater or less extent, in the establishment of day camps, dispensaries, municipal sanatoria, and hospitals for advanced cases. Boston has all of these, with the exception of a sanatorium, which is provided by the state.

Large Appropriations Necessary

We now possess ample knowledge intelligently to *control* and *prevent* tuberculosis, although, as has been said, there are unsolved problems regarding the disease which are still to be worked out in the laboratories and clinics. The task of control, however, is one of such gigantic magnitude that it requires large sums of money to accomplish it, and this must be furnished through public appropriations. " Public Health is Purchase-

able," as the motto of the Department of Health of New York City says. As tuberculosis is a people's disease, a "disease of the masses," the people must collectively, through their government, furnish the means to rid themselves of it. To do this will be a remunerative investment, and the return will be in the preservation of so many lives capable of adding greatly to the wealth of the community. It is like borrowing money for any great public improvement, which will pay for itself by the added value it brings to the community. All the many existing laws and provisions made by the states and cities for the protection and improvement of the health of the people, such as factory inspection laws, those regarding tenement-house construction and inspection, the limiting of the hours of labor, and many others, are obviously indirect means for the prevention of tuberculosis by increasing the resisting power of the individual.

What Foreign Nations are Doing

In Germany, there is a National Bureau of Health presided over by a cabinet officer, which has exhaustively investigated the tuberculosis problem in all its aspects, and, as

a result of this study, national laws have been enacted, such as the prohibition of indiscriminate expectoration, compulsory notification, disinfection, and others; while public appropriations have been made for the scientific study of tuberculosis, the erection of sanatoria, etc. The Compulsory Workingmen's Insurance Societies, already described, were established by imperial decree, in 1881. In the German army, careful attention is given to the restriction of tuberculosis, and when a case is discovered, the soldier is removed to one of the government sanatoria, or otherwise isolated, and treated. Thus Germany shows its wisdom in recognizing the equal duty and necessity of protecting the health of the workingman, who furnishes the revenue, as well as that of the soldier, who furnishes the protection to life and property. The German cities have also been active in their official capacity in the tuberculosis campaign. Some have erected municipal sanatoria, as Berlin, Strassburg, etc. In others, polyclinics, or dispensaries, are maintained.

In France a permanent commission has been appointed by the Minister of the Interior to study the causes of tuberculosis and present plans for its prevention. In 1902 the Minister

of Public Instruction caused to be distributed in all the schools, colleges, and boarding-schools, a circular with instructions concerning the prevention of tuberculosis. The government requires all the post offices to be inspected to see that proper measures of hygiene are adopted for the protection of the staff and the public. The city of Paris founded and maintains on the seacoast a large hospital of 750 beds for tuberculous children. Official aid by the government and cities is given in the establishment of sanatoria and dispensaries and in other anti-tuberculosis work.

In England there is a British Royal Commission for Tuberculosis, which was appointed in 1901, with the especial purpose of investigating the difference between the tuberculosis of cattle and that of human beings, and it has already published several volumes as the result of its experiments and investigations. Many English cities, by public appropriations, provide beds for their consumptives, either in already existing sanatoria, or, as in the case of the city of Birmingham, already mentioned, establish their own separate institutions. The National Insurance Act now provides a comprehensive plan with a liberal

appropriation for the establishment of sanatoria and other provisions for fighting tuberculosis.

Mention has already been made of governmental activity in the prevention of tuberculosis in other European countries. We have seen what the governments of Sweden, Denmark, Norway and others have done. In Japan, the imperial government has created a large hospital for the study and treatment of tuberculosis. In the United States, we have also seen what many states and cities are doing in their official capacity to stamp out tuberculosis, and the growing recognition throughout the country of the duty of the several states in this respect. Over and above all this, however, there is needed, as President Roosevelt so emphatically pointed out, "public health legislation,"—a bureau of public health,—which will actively engage in the battle against tuberculosis. "Science has shown," says Dr. Vaughn, "that disease is one of the most destructive agents to both property and life, and that many diseases are preventable. Consequently, the government that does not put forth every possible effort to protect the property and lives of its citizens against disease is not doing its duty."

XIV. THE FACTORY AND THE WORKSHOP IN THEIR RELATION TO TUBERCULOSIS

NEXT to unsanitary dwellings in crowded quarters of the city, the factory and workshop are, perhaps, the most frequent sources of tuberculous infection, and from similar causes. In the factory and the workshop the operatives are crowded together, often under unsanitary conditions, such as insufficient ventilation and light, dust and dirt; all of which are conducive to a deterioration of one's health, and hence to the preparation of a suitable soil for the bacillus. Then frequently the seed is at hand in a tuberculous workman who is negligent in the safe disposal of his sputum. Thus the crop of tuberculosis is produced, and abundant observation has proved the frequency of its occurrence. In general, as we know, the mortality of operatives in shop, mill or factory, is much higher than that of those engaged in agriculture and

out-door pursuits. Among men in mechanical and manufacturing industries, the consumption death rate is 18.8 per cent. of the mortality from all causes, whereas it is only 9.5 per cent. among men in out-door occupations. In England a similar difference is noted, and such is undoubtedly the case in industrial indoor occupations in other countries.

Importance of Protecting the Health of Wage-Earners

This high mortality from tuberculosis among workers in mills and factories is a product or penalty of the present-day civilization, hence it is a duty of civilization to remedy it, and it is of the utmost importance that most careful consideration should be given to this "occupation disease," as it has been called, for the protection of the lives and physical well-being of the wage-earners of any country means the safeguarding of its material prosperity. The influence of the deterioration of the physical condition from manufacturing industries is well illustrated by the experience of England in the Boer war, when so many recruits taken from industrial employments were found physically

unfit for army service. To maintain a good defensive power, a country must preserve the health and physical integrity of its common people, from whom the mass of its defenders are drawn. "There is no doubt," says a recent writer referring to Germany, "that her educational system, military discipline, paternal supervision of the sanitation of industrial establishments, control of insurance of employees, all lead to the development of a strong, healthy working class, and when to these there is added the development of a high moral character, the result is a nation well nigh impregnable to attack."

Remedies for Evils of Industrial Infection

In order to remedy this evil of "industrial infection," as it is called, we must work in two main directions: first, protect the well employees from infection through tuberculous fellow-workmen; and, second, so regulate and guard the work-places—the shops and factories—that all those injurious influences which produce a favorable soil, a lowering of the resisting power, may be, so far as possible, eliminated,—in brief, afford the workman a healthy environment to work in. With a large number of operatives in a confined space, it is almost inevitable that some of them should be

tuberculosis, though able to work, and the problem is, how to discover and render safe, or remove such tuberculous operatives. The solution is difficult, and the only perfect way would be to examine all persons upon their entrance into the factory, or mill, and periodically thereafter. In a few instances this has been done, as in a large chocolate factory in Bristol, England, where every person seeking employment has to undergo an examination of the heart and lungs. At present, however, a general application of this plan would seem to be impracticable unless legal enactment by the state should require it, and there is much to be said in favor of this. Massachusetts, for example, now requires that all factories shall be well lighted, well ventilated and kept clean; that cuspidors shall be provided; that there shall be proper sanitary arrangements; that medical and surgical appliances shall be kept in all factories; that proper egresses, fire-escapes, and fire extinguishers shall be provided: and inspectors are appointed to see that these things are done. Why not extend this paternal care of its working people, and require a periodic examination of the lungs of each operative, perhaps of equal or greater value with these other requirements, when one con-

siders the frequency of tuberculosis among indoor workers?

What is Now Being Done

Much, however, is already being done by considerate employers and tuberculosis associations for the detection of tuberculosis among employees and provision for their treatment. Placards and notices are displayed in workrooms, calling attention to the dangers of indiscriminate spitting, and giving some of the facts regarding tuberculosis and its symptoms. Cuspidors are provided. In Massachusetts these are required by law. In the government printing office in Washington, where 4,800 persons are employed, about 1,400 cuspidors are provided, which are cleaned and sterilized with boiling water and steam. In many large establishments, the employers offer free examination of the lungs to all their employees who think they may have tuberculosis, and if a case is discovered, it is offered an opportunity to enter a state sanatorium for a certain period at the expense of the employer. Overseers are asked to seek out all who have a cough, or show suspicious symptoms of tuberculosis. In a large manufacturing establishment in New England, the following notice was posted by the management:

"There is at present a strong effort being made to exterminate the disease, consumption. It is known to be very easily curable if the treatment is begun in the early stages, and readily prevented by proper ways of living. The hopeless or incurable cases are those that have been allowed to go neglected. In order to aid in this matter we have provided, free of expense to our employees, a physician who is especially interested in this disease, and who can advise about the best treatment; and for the purpose of helping those who may be afflicted and protecting others, we shall feel free to suggest an examination of any who may possibly have symptoms of this disease as indicated by coughing, loss of appetite or weight. If the lungs are found to be healthy, there is then no need to worry; if on the other hand, there is any disease, it can be treated before it is too late."

In a considerable number of factories in various manufacturing cities in Massachusetts, the employers are co-operating with the State Inspectors of Health, who are physicians, in detecting cases of tuberculosis among their employees, or employ physicians themselves for the purpose, and when an early case is found, it is sent to the State Sanatorium at the expense of the employer.

The Plan of Mutual Aid in Connecticut

In Connecticut a movement has been organized in most of the large manufacturing cities, whereby both the employers and employees unite in caring for tuberculous workmen in their respective factories. A certain sum of money is subscribed by the workingmen, and a sum equal to the total amount contributed by his men is generally contributed by the employer, which combined sum is used for the treatment of needy consumptive workmen in sanatoria. The various factories thus contributing form a sort of Union whereby the weaker ones are aided by the stronger. The families of the consumptives are also aided by this means. This plan resembles, in a way, the insurance system of Germany. In a number of large manufacturing establishments provision for the examination of employees suspected of suffering from tuberculosis, is made at the expense of the employer, and this practice is extending.

If these examples could be generally followed by employers of labor in factories, and the operatives themselves would cooperate with the employer in the efforts to protect them from the danger of tuberculosis infection, much could be done in eliminating tuberculosis from the fac-

tory. The workman will not, under these conditions, seek to conceal his disease for fear of losing his position, but rather desire to avail himself of the proffered opportunity of timely treatment. Many difficulties are, however, encountered in the ignorance of the operatives and their reluctance to seek an examination if they have suspicious symptoms, or failure to appreciate the value to themselves or the dangers to which they are exposing their fellow-workmen. The general dissemination of tuberculosis education through labor unions, of which most workingmen are now members, and through the placards displayed in the mills, and other ways will aid in creating an appreciation of, and a response to, the efforts made by the employers to prevent the spread of tuberculosis in the factory. When it is remembered that one "open" case of tuberculosis infects at least three others, it is apparent that the only safe procedure is to remove every such case from the workshop as soon as discovered and to make every effort to discover all such cases.

Better Conditions of Factory Life

The second direction in which we must work to eliminate tuberculosis from the fac-

tory and mill is the provision of a wholesome environment for the workman and protection from deleterious influences incident to the kind of work he is engaged in. Much already has been accomplished in this direction by the appreciation of their responsibility for the health and well-being of their operatives by many employers, and by laws enacted by enlightened state governments regarding the equipment and inspection of factories and mills, the shortening of hours of labor, restriction of woman labor, and the prohibition of child labor.

The ideal to be attained is a clean, well-aired and lighted mill, with room sufficient to afford each his proper air space, freedom from dust or proper apparatus for removing dust, and facilities for bathing after the day's work. In addition, opportunities for rest at the noon hour, in a clean, pleasant room, are provided by some employers. What the state of Massachusetts requires by law in the direction of the fulfillment of the above conditions can, perhaps, be taken as an illustration of the present attitude of an enlightened public opinion with regard to the protection of the health of the wage-earner.

First: The law requires that all factories shall be well lighted, well ventilated and kept clean. That "all gases, vapors, dust or other impurities injurious to health which are generated in the course of the manufacturing process or handicraft carried on therein shall, so far as practicable, be rendered harmless."

Second: That adequate washing and sanitary facilities shall be provided.

Third: "Hoods, suction pipes, fans or blowers shall be provided for the protection of persons using emery wheels or other apparatus which produces particles of dust injurious to the health of the employee."

Fourth: "Suitable receptacles for expectoration shall be provided in all factories and workshops by the proprietors thereof."

Fifth: "Women employees in manufacturing, mechanical or mercantile establishments shall be provided with suitable seats for their use."

Sixth: The State Inspector of Health shall see that these various requirements are carried out in factories and workshops, and, furthermore, "shall inform himself respecting the sanitary condition of his district and concerning all influences dangerous to the public

health or threatening to affect the same." "He shall inform himself concerning the health of all minors employed in factories within his district, and whenever he may deem it advisable or necessary, he shall call the ill health or physical unfitness of any minor to the attention of his or her parents, or employers and of the state board of health." This enactment gives authority to the State Health Inspector to make a medical examination of any person employed in a factory between the ages of fourteen and twenty-one years, respectively, if, in his judgment, he considers it necessary; and if he discovers tuberculosis, he sees, if possible, that some means are provided for proper treatment.

Mortality from Dusty Trades

Mr. Hoffman, the accomplished statistician, says, in his report upon "The Mortality from Consumption in Dusty Trades," in the Bulletin of the Bureau of Labor of the United States, that it is possible by intelligent factory inspection and control, and special regard to ventilation, to almost entirely eliminate conditions injurious to health and life in factories and workshops, and industry generally, so

that the consumption death rate among wage-earners in this country can be reduced to a ratio as low as 1.5 per 1,000, which would mean an annual saving of, approximately, 22,238 human lives, and which would represent an economic gain of $68,493,000 each year!

"In New Zealand," Prof. Schrötter tells us, "workmen are only admitted to dusty occupations after a special examination, which is repeated from time to time. Should any signs of illness reveal themselves, they are immediately dismissed." Would it not be wiser to employ means of getting rid of the dust?

Prof. Winslow, of the Massachusetts Institute of Technology, gives a striking instance of "The Cash Value of Factory Ventilation," as he calls it. In a toll room of a telephone company there were only windows at front and back which could not be, or were not, opened in winter, and, consequently, the air became vitiated. At a cost of seventy-five dollars, a system of ventilation was installed, and following this change there was a marked improvement in the comfort and general condition of the operators. In the winter subse-

quent to the installation of the ventilating system, the average percentage of absences among sixty-odd girls was reduced one-half, and in the three winter months alone the saving amounted to one and eight-tenths the entire time of one operator, equivalent to a profit of $195 for the company on a capital investment of $75.00.

The Peril of the Sweat Shops

In the notorious sweat shops and tenement-house tailor shops, conditions for the spread of tuberculosis are often well-nigh ideal: dust, dirt, rags and dried sputum abound; and yet we are told that the fashionable tailor sends out his cut material to be made up in such shops and that the expensive custom-made suit is thus manufactured under worse sanitary conditions than a cheap ready-made one. Many consumptives work in these shops, and expectorate on the floor, thus passing along the disease to their unsuspicious neighbor. The wages are small, the hours of labor long, and the surroundings filthy and most unsanitary. What more favorable breeding places for tuberculosis could be conceived! Seed in plenty and the conditions are present for the constant manufacture of a fertile soil. A

single example from the observations of the state medical inspector of Boston, Dr. Linenthal, will vividly show us how the process takes place. A two-room flat on the top of a building, situated in a narrow, dirty street; three persons living in these rooms,—a young man of twenty-five with his mother and grandmother. The two women finished pants at home, their only means of subsistence; the young man a consumptive and unable to work. A small, low-studded room, used as a kitchen and workroom, served at night as a bed-room for the consumptive; the windows closed, a kerosene stove burning, the young consumptive remaining at home all day in this suffocating air.

"The inadequate rate of wages," says Dr. Linenthal, "the excessive hours of labor, the unsanitary state of the shops, make of our clothing industry a sweating industry, with all the predisposing factors of tuberculosis in full operation." The root of the evil, he declares, is the contract system,—the manufacturer handing over the cut material to the contractor, who, in consequence of the close competition, makes the goods for a small compensation.

The remedy is public knowledge of the ex-

isting conditions and a demand for clean clothing. The sweat shop, as such, ought no longer to exist, for it is a hot-bed for breeding tuberculosis. So long, however, as it does, it must be rigidly inspected and kept under constant supervision, and when a consumptive is discovered in such places, he should be removed. The dirty, ignorant, newly arrived immigrant, the sweat shop, and the crowded tenement, form a combination admirably fitted to spread tuberculosis. This combination can be broken, however, by arousing public opinion, by an efficient active board of health and strict and adequate tenement-house inspection.

The Remedy for Dust in Factories

Reference has already been made to the heavy mortality from consumption among persons occupied in dusty trades, and there are but few in which dust is not given off. Many investigators have studied the conditions, and the general conclusion is that the one universal and effective remedy is ventilation: to remove the dust at its point of origin, and insure an abundant supply of fresh air. That this is both practicable and possible at moderate ex-

pense, has been shown by an English committee appointed to inquire into the ventilation of factories and workshops. It seems almost incredible that the needless and enormous loss of human life from consumption due to dust in industrial pursuits and the financial loss incurred therefrom, as shown above, should be allowed to go on. "Nothing within reason," says Mr. Hoffman, "should be left undone as a national, state, and individual, or social, duty to prevent it," and yet, he concludes, "thus far the problem of scientific ventilation and effective dust removal has been almost entirely neglected in American establishments."

In this age of industrialism and the eager strife for immediate and large pecuniary results, human life, of inestimable value, is often lightly held and needlessly sacrificed on the altar of gain. The most valuable asset of any country is men and women of healthy, robust physique, and when, in its development, these are sacrificed, the decline and fall of that country in no distant future can be predicted, as the history of the past has shown.

Department Stores and Shops

In department stores and shops, there are all too frequently rich opportunities for the preparation of the favorable soil for the tuberculous infection. A bookkeeper or clerk is often tucked away in a gallery, or a corner, breathing the hot, vile air from the floor below, contaminated with dust and nobody knows how many infectious germs. Great department stores are often most inadequately ventilated and lighted and overcrowded. How many young lives are thus lost from consumption, the favorable soil for which was prepared in this way. Some department stores are already realizing their obligations to their employees, and provide a physician to look after their health in a general way. What should be done, however, and the writer ventures to predict that the time is coming when it will be done, is to examine the lungs of every clerk and employee in such establishments upon their entrance into the employ of the firm, and periodically thereafter.

Waiters, Nurse Girls and Servants

The same precaution ought also to be taken with regard to waiters in hotels, who, in the writer's experience, have not infrequently

been found to be tuberculous, for in the handling of the food and the intimate associations with so many others, the opportunities for communicating the disease are great. Again, with nursery maids, cooks, and servants in private houses, this also should be done. How much better to find out that tuberculosis exists in such persons before their employment in the household than later, when the children and family have been exposed to the disease; and this is no imaginary fear,—it has happened not infrequently. No one desires to employ in the family a person who has not been vaccinated. Every school child is obliged to present a certificate of vaccination upon entrance to the school. Is it not at least equally important to require evidence of absence of tuberculosis in servant and pupil, when we consider the enormous prevalence of the latter, and the infrequency of smallpox?

Tuberculosis in Prisons

In former years tuberculosis was very prevalent in prisons, so much so that it was regarded as a disease peculiar to these institutions and called "prison tuberculosis." Thus as late as 1893, a report from the Illinois State Prison says that fully one-third of the

1,400 convicts within its walls have consumption in a light or bad form; and that nearly all deaths in the penitentiary are caused by consumption. All "long timers" as a rule, it continues, "either die within the walls from the disease or are pardoned out on account of it."

The cause is very evident, for the prisons were crowded, and little if any attention was paid to the sanitary conditions and ventilation, and the tuberculous inmates mingled freely with the others and expectorated at random. In part, this condition was due to the ignorance of the communicability of tuberculosis, and in part to the old idea that the prisoner was there to be punished, not to be reformed, and the protection of his health and the provision of wholesome conditions of living received but secondary consideration.

At the present time many prisons and jails are still conducted upon the old ideas and are woefully defective in proper hygienic construction and equipment. It is estimated that about 15 per cent. of the prison population of the country at the present time is suffering from tuberculosis. The tuberculosis Crusade, however, has invaded the penal institutions, and both direct and indirect means are being employed in many prisons to protect

the well inmates from exposures to infection and to treat the tuberculous ones by the modern methods of out-door life and good hygiene. Prison workshops are better ventilated and cleaner, cells are larger and are supplied with suitable means of ventilation and more light, and are kept clean. The physical care of the prisoner is given more careful attention in the matter of bathing, food and exercise. The new humane idea is now gaining ground that the prisoner is a human being with a soul, and not a brute, and as such should receive such physical and moral training as will incite him to reform and not to sink deeper in degradation. As a part of the responsibility of the state towards the prisoner, is his protection from exposure to tuberculosis while in captivity.

In a number of states tuberculosis prisoners are now afforded opportunity for taking the open-air treatment and are separated from the other inmates in order to avoid the possibility of communicating the disease to them. In Massachusetts a prison hospital or sanatorium has been established at Rutland not far from the State Sanatorium, to which all consumptive prisoners from the various prisons and jails of the state are transferred. At Clinton Prison, New York, in the Adirondack Moun-

tains, there are special wards for the tuberculous prisoners of that state. In Texas is a state farm for the same purpose where the consumptive prisoners who are able to work are employed in light farm work, gardening, etc. Previous to the use of this farm, says Dr. Ransome, 50 per cent. of all the deaths in the prisons of the state of Texas were due to tuberculosis, while during the three years of existence of the farm the total number of deaths in prisoners from this disease was a little less than 25 per cent. Much, however, remains to be done, for there are now less than 25 special institutions and hardly 800 beds for the 12,000 tuberculous prisoners in the state, federal and local prisons and jails of the United States.

Tuberculosis in Insane Asylums

Formerly tuberculosis was as prevalent in insane asylums as in prisons, and from very much the same causes. No effort was made to control the insane consumptive, and thus he infected others, while overcrowding and lack of ventilation readily prepared the soil in those who were already in a defective physical condition, as most insane persons are. Fifty years ago in one insane hospital in Massachu-

setts, 33 per cent. of the deaths in one year were due to tuberculosis, and at the present time the percentage of deaths from tuberculosis among the insane is from 50 to 200 per cent. higher than among the general population according to the institution. At the present time the consumptive insane are segregated, and in many states provision is made for giving them the open-air treatment. The result of this has been a reduction of mortality from tuberculosis. Thus, in 1900, the average mortality in all the New England insane hospitals was 11.9 per cent. The general improvement in the care of the insane, and in the construction and ventilation of asylums, has also contributed to the lessened mortality from tuberculosis. Yet the fact remains that out of 225 public hospitals for the insane with a population of fully 150,000, only 70 or less than one-third of them make any provision for their tuberculous inmates. So the great Crusade against tuberculosis permeates, in its beneficent influences, the prison and the asylum, the workshop and factory, with its message of hope; and if it does not always bring healing on its wings for the afflicted, it tells him how he can avoid infecting others, and by its gospel of fresh air and good hygiene, it shows how best the disease can be resisted.

XV. THE FUTURE OUTLOOK

WE have come at last nearly to the end of the story of the Great White Plague, a story that has not been all sadness in the telling, but rather illuminated with great hope for the future. We have seen in our narrative that tuberculosis is a universal and very prevalent disease, affecting mankind at the most valuable period of life; that it is a contagious or communicable disease, the cause of which we know; and that it is not inherited. We have learned that it requires a favorable soil in the body to produce the active disease, and we have seen how innumerable are the influences which produce this favorable soil. We have found that it is very curable if taken in the beginning, and that the cure is not by medicines, but by open-air treatment, the method of which, as conducted in a sanatorium or at home, we have learned. We have studied the means of prevention, both by con-

trolling the source of infection and by rendering the soil unfavorable. The social conditions which are favorable for the spread of the disease have been considered, with their remedy, and among them we have seen that overcrowding in in-door life, bad air, and the abuse of alcohol are three of the most frequent predisposing causes. Again, we have learned that tuberculosis is frequent in childhood, and the various means employed in different countries to protect the child from contracting the disease, and to cure it when affected, have been considered. In the great crusade against tuberculosis, we have seen what the weapons and methods are which the various countries of the world are using in the warfare; how the educational propaganda has extended until the simple facts regarding the disease are becoming almost as universally disseminated as the waters which cover the seas.

When we consider in detail the means of prevention, they seem almost hopelessly many and complicated, but the great principles, after all, are few and simple: to find out every consumptive; to render safe or isolate every consumptive; and to improve the living con-

dition of the masses. It is controlling the seed and rendering the soil infertile. As gigantic a task as this is, it can be done and is already in the process of accomplishment.

Resolutions of the International Congress

In this connection it will be well to give the resolutions of the International Congress at Washington, as indicating the future most important lines of effort in the opinion of the best authorities throughout the world. They are as follows:

"1. The attention of state and central governments should be called to the importance of proper laws for the obligatory notification by medical attendants to proper health authorities of all cases of tuberculosis coming to their notice, and for the registration of such cases in order to enable the health authorities to put into operation adequate measures for the prevention of the disease. We urge on the public and on all governments the establishment of hospitals for the treatment of advanced cases of tuberculosis.

"2. We urge the establishment of sanatoria for curable cases of tuberculosis.

"3. We urge the establishment of dispen-

saries and day camps for ambulant cases of tuberculosis which cannot enter hospitals or sanatoria. Again the utmost efforts should be continued in the struggle against tuberculosis to prevent conveyance from man to man of tuberculous infection as the most important source of the disease. Further preventive measures must be continued against bovine tuberculosis, and the possibility of the propagation from this to man should be recognized.

"*Resolved,* That this Congress indorse such well-considered legislation for the regulation of factories and workshops, the abolition of premature and injurious labor to women and children, and the securing of sanitary dwellings as will increase the resisting power of the individual to tuberculosis and other diseases; that instruction in personal and school hygiene should be given in all schools for the professional training of teachers; that wherever possible such instruction in elementary hygiene should be entrusted to properly qualified medical instructors; that colleges and universities should be urged to establish courses in hygiene and sanitation, and also to include these subjects among their entrance requirements to stimulate useful ele-

mentary instruction in the lower schools. That this Congress indorses and recommends the establishment of playgrounds as an important means of preventing tuberculosis through their influence on health and resistance to disease."

A Look Forward

In conclusion, we are now in a position to look forward, and from what has already been gained, with some degree of definiteness, forecast the future. We ask what will be the final result of this mighty movement? Can we ultimately, within an appreciable period of time, eliminate tuberculosis so that it will become as rare as leprosy, for example, now is? Shall we at last free mankind from this its inveterate foe? Theoretically, we know we can, for we have learned that tuberculosis is a preventable and avoidable disease; but can this practically be accomplished?

Those who have been the leaders in the great campaign believe that it can, as herculean as the task seems to be; and what has already been gained in the diminution of the disease is strong evidence in support of this opinion. "I believe," says Dr. Biggs, the ac-

complished medical officer of the New York Health Department, "that tuberculosis can be practically stamped out," and in support of this opinion he says that the reduction in the mortality from it in New York City since 1886 has been about 40 per cent. "I certainly believe," said Prof. Vaughan, of the University of Michigan, in an address at the Tuberculosis Congress at Washington, "that the time will come when tuberculosis will no longer curse our race." "We see then," says Prof. Irving Fisher, "that the modern Crusade against consumption means more than appears on the surface. It means, to be sure, the saving of the lives of many afflicted with the 'Great White Plague,' but it means, further, a continual lessening in the numbers thus afflicted . . . it means that tuberculosis will soon be dethroned from its position as chief of the diseases, and ultimately eradicated altogether." "If every individual in his respective sphere, and the local state and Federal governments would do his full duty," says Dr. Knopf, "in the combat of this fearful scourge of mankind, so justly called the 'Great White Plague,' I am convinced that before many decades tuberculosis would be

eradicated from our midst." "The Germans now look forward," quotes Prof. Lowman from a German authority, "with increasing confidence, to a new future, to a new golden age, when there will be a Germany without tuberculosis." "We may reasonably prophesy," declared Prof. Brouardel of Paris, at the British Congress on Tuberculosis, "that, united in one brave attempt, the whole civilized world will succeed in exterminating the cruelest scourge that has ever fallen on us, our children and our friends, and which threatens the future of our countries."

At the same Congress Prof. Koch, in his memorable address, spoke as follows: "There are many, indeed, who doubt the possibility of successfully controlling this disease, which has existed for thousands of years, and has spread all over the world. This is by no means my opinion. This is a conflict into which we may enter with a surely founded prospect of success. . . . This is a visible and palpable enemy which we can pursue and annihilate, just as we can pursue and annihilate other parasitic enemies of mankind."

"Science has demonstrated," said former President Roosevelt in his letter accepting the

presidency of the International Congress on Tuberculosis, "that this disease can be stamped out, but the rapidity and completeness with which this can be accomplished depend upon the promptness with which the new doctrines about tuberculosis can be inculcated into the minds of the people and engrafted upon our customs, habits and laws."

Twelve years ago the writer of this book made the following statement, which, with our present knowledge and experience, he feels could be made even more emphatic: "I firmly believe that it is possible, by a union of all the resources at hand—state and law, individual and organized exertions, enlightenment of the public as to the dangers of the dried sputum and their avoidance, and the utilization of all the means at our command to increase the general average of health—so to reduce the mortality from consumption that it may become one of the rarer diseases instead of the most common as now."

Some Statistics of the Diminution of Tuberculosis

The statistics already at hand of the general diminution of deaths from tuberculosis

bring the same message of hope for the future extermination of the disease. According to carefully collected statistical evidence, Mr. Hoffman, the statistician of the Prudential Insurance Company, shows that in the decade from 1901 to 1910 the death rate from tuberculosis of the lungs in the United States (the registration area) decreased 18.7 per cent., while the general death rate, including all causes of death, declined only one-half as fast. This decline in the tuberculosis death rate means the saving of 27,000 lives. In the Northern and Western cities of the United States the death rate from tuberculosis of the lungs has declined since 1881 from 325 to 160 per 100,000 inhabitants, or 50.8 per cent. In the Southern cities there has been a decline of 50.2 per cent. for the whites, and 36.7 per cent. for the colored population since 1881.

In the three industrial Eastern states, Massachusetts, Rhode Island and Connecticut, with a population of over 5,153,000, from 1881 to 1911, the decline has been from 293 in 1881 to 128 in 1911 per 100,000 inhabitants, or 56.3 per cent. In the cities of New York (Manhattan and Bronx), Philadelphia and Boston combined, the decline from 1881 to 1912 has been from 381.1 to 180.1 per 100,000 of pop-

ulation, or 52.7 per cent.; while in the cities of New York (Manhattan and Bronx), Philadelphia and Boston singly, the decrease from 1881 to 1912 has been, respectively:—53.7 per cent., New York; 48.7 per cent., Philadelphia; and 63.2 per cent., Boston, and in the latter city the rate has dropped in twelve years from 250 per 100,000 to 146, or 42 per cent. In Massachusetts the death rate from consumption has been reduced one-half in the last twenty years.

"All the evidence obtainable," says Mr. Hoffman, "confirms the conclusion that the reduction of the tuberculosis death rate in the United States during the last forty years has not been less, but in many cases much more than in other civilized countries throughout the world." In England and Wales there has been a reduction of 43.7 per cent. in the last thirty years. In large German cities, from 1880 to 1909, the death rate from tuberculosis has decreased from 346 per 100,000 of population to 179, or 48.2 per cent., while in American cities during the same period the decrease has been 42.3 per cent. This difference in favor of German cities is attributed by Mr. Hoffman to "the systematic and effective treatment and care of tuberculous wage earn-

ers in special institutions or sanatoria established for the purpose, and many collateral institutions and efforts contributory thereto."

Similar diminution in the death rate from tuberculosis is taking place, to a greater or less extent, in all countries and cities of the civilized world, as their various statistics indicate; but enough has been given to prove the success of the great warfare against the disease, and to give every hope for a continued gradual decrease until the disease becomes practically eliminated. "At the present rate of decrease in the mortality from consumption," said Dr. Abbot, the late secretary of the Massachusetts State Board of Health, "it does not seem at all impossible that, within the next half century, the sanatoria now occupied by consumptives may possibly be filled by those suffering from cancer, since cancer appears to be steadily increasing while consumption is tending towards extinction." We have already seen how the leper hospitals in Norway have been converted into sanatoria for tuberculosis, now that leprosy has been practically extinguished.

"The real triumph of the campaign against tuberculosis," as Mr. Hoffman so justly concludes, "is the human factor, representing, on the one hand, the faith and work of those who,

by intelligent co-operation and indefatigable industry, have reduced the warfare against this disease to a science, and, on the other, the immeasurable amount of human happiness brought to the countless homes and hearts of those who, but for the success which has been achieved, would have had only sorrow and suffering, and who would have faced the future in helpless despair."

The Advance in the Future

It is probable that from this time on, the diminution will be slower than it has been in the past, for we have already partially corrected many of the grosser causes of the former prevalence of the disease, such as restriction of indiscriminate spitting, the control of the advanced consumptive, the protection of his family, many of the social conditions which predispose to this disease, etc. In the future, our work must be more intensive, comprehensive, and systematic. "It is not a very difficult problem," to quote Mr. Hoffman again, "to reduce an excessive death rate to one of moderate proportions, but it requires the highest skill in sanitary administration. Using that term in its broadest sense, considerably to reduce a low death rate still further,

and most of all in the case of so subtile and widely diffused disease as tuberculosis." We must work harder, and have a great deal more money to work with. "The time is not far distant," said Dr. Biggs in 1903, "when those states and municipalities which have not adopted a comprehensive plan for dealing with tuberculosis will be regarded as almost criminally negligent in their administration of sanitary affairs and inexcusably blind to their own best economic interests." In the great advances made in the early detection of consumption and the consequent timely treatment, there is and will be increasingly in the future the greatest assurance that the individual who has the disease will recover; and what a contrast this hopeful outlook is to the former hopeless attitude! Furthermore, the various methods of home treatment now being extended and generally adopted and this increase of state sanatoria bring the opportunities of successful treatment within the means of the poorest.

The Open-Air School in the Future

We have spoken of the open-air schools for "closed" cases of tuberculosis in children. Their value as a curative and preventive measure has been so clearly demonstrated

By courtesy of Elizabeth McCormick Fund.

A TYPICAL OPEN-AIR SCHOOL.

that one can predict with great assurance that in the future they will be established in all large cities as they already have been in nearly 50 cities, and thereby thousands of tuberculous children will be cured and grow up to make their contributions in various channels of useful effort to the communities in which they live. Nothing is more hopeful and encouraging than this work with tuberculous children, which, in the future, is destined to become a great and important feature of the tuberculosis campaign.

Influence of This Movement in Preventing Other Diseases

This great tuberculosis movement has been of incalculable value in exciting effort for the prevention of other diseases and conditions inimical to health, and as time goes on, we shall see the results of its influence in this direction more definitely. Already there is a marked uplift in the living and working conditions of the masses, but it is just a beginning. The gospel of fresh air has never been so universally proclaimed as it is to-day through the influence of the tuberculosis movement. A new and mighty impulse has been set in motion, looking towards preven-

tion, due in no small measure to the tuberculosis crusade. As President Eliot has recently told us, the doctors of the future are to be chiefly occupied in the prevention of disease, and already the medical schools are teaching preventive medicine. May we not look forward to a new era in civilization when our efforts shall not be exerted so much, as in the past, in establishing elaborate and expensive institutions for the treatment and restraint of those physically or morally diseased, but rather for the prevention of those conditions which make these necessary, the prevention of disease, poverty and crime. We can well repeat the significant words of Mr. Casimir Perier: "The struggle against tuberculosis is intimately bound up with the solution of the most complex economic problems, and any plan will be imperfect which has not for its foundation the material and moral improvement of the people."

Another Influence — Peace Between Nations

One of the great incidental values of the world-wide Crusade against tuberculosis is the fraternal feeling engendered by the union of all nations and peoples for the common pur-

pose of preventing and eliminating this common enemy of mankind. This is impressively emphasized at the International Congresses on Tuberculosis such as the one held in Washington in 1908 and in Rome in 1912, where are gathered physicians, sanitarians, philanthropists and men and women engaged in the great conflict from all over the world, representing various forms of governments, and speaking many tongues, but all with the kindliest feelings, one towards another, because they were united by the one single beneficent object of stamping out tuberculosis.

May we not hope that this universal union for a common purpose may have a definite and real influence in uniting nations closer together, and create a deeper realization of the value to each of the union of all in efforts to stamp out disease and thereby increase the welfare and happiness of mankind. May not this influence be of value in promoting peace between nations, and ultimately lead to a more enlightened attitude with regard to the present enormous expenditures for war preparations, and a mutual agreement to limit, in the future, such preparations for the destruction of life and property, and to increase their efforts and

appropriations for the preservation of life and the prevention of disease.

No one would dare predict the rapidity with which tuberculosis could be eliminated if even a portion of the annual appropriation made for military purposes could be employed in the warfare against it. We may confidently hope that this grand movement which has taken possession of the whole civilized world will, in the future, accomplish more than even the eradication of tuberculosis,—that it will bring together, in friendly rivalry to increase the well-being of humanity, the nations of the world, promote peace between them and put an end to the present feverish haste to build up huge armaments, and turn the efforts of the governments into peaceful and beneficent channels for the protection of the health of their people and the increase of their happiness.

CHAPTER XVI. THE LUNGS AND THEIR USE

WE have learned that nearly nine-tenths of all cases of tuberculosis are of the lungs—consumption—and it is, therefore, of the highest importance to have some clear knowledge of the function and proper use of these organs,—we should know something of their anatomy, what service they perform, how to use them, how to maintain them in their integrity, and what injurious influences to avoid. If one were to ask a young school boy what the lungs were for, he would undoubtedly promptly reply, "To breathe with," and if he should then be asked, "Why do we breathe?" he would again as readily reply, "If we didn't breathe, we should die." If, however, he were asked the third question, "Why should we die if we didn't breathe?" he would probably hesitate before answering this question, if he answered it at all, unless

he had arrived at the grade where the elements of physiology are taught in the schools.

Why Do We Breathe?

Through the medium of the lungs, as we know, the oxygen is taken into the body by the act of respiration, and carbonic acid (carbon dioxid), a poisonous gas, is given off. In other words, respiration does for the body what a draught and a chimney do when there is a fire in a room: it brings in oxygen to unite with the fuel, the absorbed food, and produces combustion, and it carries away carbonic acid, the waste product of combustion. Through an infinite number of minute blood vessels called capillaries, which cover the thin walls of the lung cells, or sacs, called "alveoli," all the blood of the body passes every minute or two, and in its passage the oxygen in the air cells, which has been brought in by respiration, passes through the thin cell walls and enters the blood, while the carbonic acid, the waste product of combustion, passes out of the blood into the cells and is carried away by the act of expiration—breathed out.

After the digested food is absorbed—taken

into the blood—it is carried through the body and delivered to the body cells, which constitute the body tissues and organs, according to the needs of each. Within these cells combustion takes place by the union of the elaborated food and the oxygen, and, as a result, energy is generated. It is like a fire in a furnace under a boiler, which produces steam, which, in turn, is transmuted into power through the medium of the steam engine. After having delivered its supply of fuel and oxygen, the blood takes up the waste products of combustion, the smoke and ashes, so to speak, and carries off some through the lungs in the form of carbonic acid, and others through the kidneys in other forms.

Thus heat and energy are constantly furnished the body, maintaining a fixed temperature and enabling it to carry on all the vital processes of life. We see, then, how essential to life and activity respiration is, and, likewise, how important pure air is to supply the constant demand for oxygen. The lungs are beautifully adapted for the work they have to do. Let us examine their mechanism and see how they work.

The Cavity Which Contains the Lungs

In the first place, the lungs are safely ensconced in the bony framework of the chest, called the thoracic cavity, which is formed by the backbone, or thoracic spine, the ribs, which are attached to the spine by a hinged, or movable joint, and in front by the breast-bone, or sternum, to which the ribs are joined by a tough, elastic substance called cartilage. The top of this thoracic cavity, or chest, is shut in by the muscles about the neck, and the bottom, or base, is closed by the diaphragm, which is a broad, thin, dome-shaped muscle attached all around to the bony framework.

Besides the lungs, the chest cavity contains the heart, with its great blood vessels. The spaces between the ribs are closed by the intercostal or between-rib muscles, and they, with the diaphragm, are the principal muscles in action in ordinary breathing, though in forced respiration other muscles about the chest are called into play. The intercostal muscles pull up and out the ribs so as to enlarge the cavity of the chest, expand it, as we say, and at the same time the diaphragm is drawn downwards by its own contraction so

as to give the expanded lungs more room in that direction.

The Mechanism of Respiration

When the chest cavity is thus enlarged, the air rushes into the lungs and expands them so that they fill up the enlarged space. This is inspiration. In expiration, the chest walls recede and the elasticity of the lung tissue contracts them and pushes out the air. Thus inspiration is an active process, caused by muscular contraction, while expiration is a passive one. The act of respiration takes place normally from 16 to 20 times a minute.

In order that the lungs may expand equally in all directions, and that their movement in respiration may take place smoothly and without friction, the inside of the chest is lined with a thin, delicate membrane, called the pleura, which has double walls, the outer one being attached to the chest wall and diaphragm and the inner one to the lungs. The surface of the pleuræ is kept moist with a thin, yellowish fluid, which serves the same purpose as oil on the bearings of any piece of machinery. Thus, in healthy respiration, the movement of the lungs is without sensation.

When, however, the pleuræ become roughened by inflammation, as they not infrequently do, we at once experience pain in breathing, which we call a "pleuritic" pain, or "pleurisy," and in order to avoid the pain we involuntarily restrict the respiratory movements.

The Upper Respiratory Tract

The lungs are connected with the outer air by means of, first, the nose, then the pharynx behind the mouth, next the larynx lower down which leads into the trachea or wind pipe, which divides into two great branches, one going to each lung, called the bronchi. These again are divided into smaller and smaller branches until finally they end in the tiny air cells, or "alveoli."

The respiratory tract is lined with a membrane called "mucous membrane," and is moistened with a sticky substance, "mucus." There are also on the inner walls of the air passages fine hairlike processes, called "cilia." The mucus catches the dust particles in the respired air, and the "cilia," which have a continuous movement upwards, sweep out the mucus and dust, thus irritating substances in the dust, and whatever bacteria or

germs it contains are prevented from entering the lungs.

Size, Weight and Capacity of the Lungs

The lungs fit snugly into the pleura-lined chest, their rounded top or apex projecting into the neck about one and one-half inches above the collar bone, or "clavicle," and their concave base fitting accurately upon the convex top of the diaphragm. The weight of the lungs is between 5 and 6 pounds in men, and 4 to 5 pounds in women. They have been compared to a sponge, because, as we have said, they are composed of innumerable cells filled with air, and when placed in water they will not sink.

Any impediment to the free movements of the chest walls, or action of the muscles of respiration, interferes with the free expansion of the lungs. Such impediments are sometimes diseased conditions, or deformities of the chest, and sometimes mechanical obstructions, such as improper posture,—leaning over a desk; or tight clothing, as corsets.

When one fills the lungs to their fullest extent and then forces out all the air possible, the amount thus exhaled is called the "vital

capacity," and is measured by an instrument called the "spirometer." This "vital capacity" in the average man is about 230 or 240 cubic inches, and in the average woman 150 cubic inches. The amount of air one generally uses in quiet breathing, called the "tidal air," is about 30 cubic inches. Hence it is seen how much unused capacity the lungs have. In order, then, to give the unused portion of the lungs proper exercise, we should practice deep breathing just as we exercise other parts of the body. Full and free respiration strengthens the lung-tissue and nourishes it with well-oxygenated blood; its vitality is increased in direct proportion to its work, and its resisting force is thereby increased.

Inadequate Respiration a Danger

On the contrary, inadequate and partial respiration, such as many persons of sedentary habits and in-door occupations are accustomed to, throws into disuse more or less of the lung-tissue, and reduces its vitality. In consequence of this, the nutrition of the lungs becomes defective as well as that of the entire body, and the lung-tissue becomes an inviting soil to disease and the tubercle bacillus. The

deprivation of the pulmonary exercise furnished by the articulation of words is said to be the cause of the frequency of consumption among deaf mutes.

"There is no apparatus," says Lagrange, "where we can verify in a more striking manner the law that 'action makes the organ' than in the respiratory; no organ is so rapidly modified as the lung in accommodating itself to the more active working which is demanded of it." The most common seat of attack from tuberculosis is the tops or apices of the lungs, and it is just this portion which is so inactive in the ordinary breathing of sedentary life. As in quiet respiration the diaphragm is the muscle principally in action, there is all the more reason why the person of a quiet occupation should regularly practice deep breathing in order to exercise and maintain in good condition the other muscles of respiration.

"The majority of people," says Prof. Schrötter, before quoted, "attach the greatest importance to the ingestion of the food, and even spend a large proportion of their mental activity on the various details in connection with their meals, while, as a rule, the process

of respiration, with all that belongs to it, is regarded as being less worthy of attention, as being of subordinate importance. But if one compares the 10,000 litres (610,000 cubic inches) of air which a person breathes daily, with the small volume of solid and liquid food used up by a moderate eater; if one considers that the quality of the air is really much more important than that of the diet, and, lastly, if one considers that a person can fast for days but dies in a few minutes if the respiration is stopped, one realizes the error of this view and the vital importance of the respiratory process."

We Should Breathe Through the Nose

In order to maintain the lungs in healthy activity, we must have, first, a free entrance of air into them through the upper respiratory passages; second, pure air; third, an adequate and unimpaired breathing mechanism,—the respiration should be full and free. In the first place, we must breathe through the nose, which was intended for that purpose. Mouth-breathing is pernicious, for it allows the dust and whatever uncleanliness is in the air to pass directly into the lungs without the preparation and sifting which it is subjected to in

the nose. A simple and yet efficacious method of curing mouth-breathing is to paste a piece of strongly adhesive plaster over the mouth on going to bed. The nasal passages should be free, and if narrowing or obstructions exist, either in front or behind, such as deviations of the nasal septum (the dividing partition) in front, or adenoid growths behind, they should be removed.

The peculiar structure of the nasal passage, which forms a sort of winding route for the air in its course through it, "over hill and dale," enables it thus to sift the air, and free it to a great extent from dust and germs; warm and moisten it, so that it finally enters the lungs clean and of the proper temperature and moisture. Even very cold air is, to a certain extent, warmed in the nose, so that one can breathe the air of the Arctic regions with impunity. Warm air likewise does not injure the lungs. It is a marvelous provision of Nature which enables one to breathe air fifty degrees below zero and one hundred and fifty degrees above, without harm.

Importance of Pure, Fresh Air

Very dry and hot air, such as that so often found in a furnace-heated room in winter,

dries up the nose and throat, and interferes with the action of the "cilia," those constantly moving sweepers. It is, therefore, important that there should be some means in living rooms for maintaining a sufficient amount of moisture in the air; an average relative humidity of about 70 per cent. is most wholesome and comfortable.

The air which we breathe should be pure and fresh, as we have learned many times in the course of this narrative. It should be free from dust, smoke and carbonic acid, as in air breathed and rebreathed in a crowded room with insufficient ventilation. Absolutely pure air can nowhere be obtained in civilized communities,—there are always more or less impurities in it; but we can breathe the purest air there is about us. Night air, as has been before mentioned, is as good as, and sometimes purer than, day air. The inhalation of smoke, a common habit with cigarette smokers, irritates the delicate lung-tissue, and renders it more susceptible to infectious germs.

Respiratory Exercises

With a free passage through the nose, and

the purest air we can obtain, the next thing is to ensure full and free respiration, and this we must do by general and respiratory exercises.

(a) General Exercises: Many general exercises are good for respiration, such as swimming, running, tennis, skating, rowing, mountain climbing, free hand class work in a gymnasium, dancing, singing, rope jumping, etc. It is said that rope jumping is a common form of exercise with boxers for increasing the "wind." All exercises which bring the legs into violent action are especially good for respiration on account of the number and size of the muscles employed.

(b) Special Exercises: Besides these general exercises, there are other direct, or local, respiratory ones, especially directed to the development of the respiratory muscles and lungs. These especial respiratory exercises are simple and yet efficacious, such as, standing erect in a well-ventilated room, or, better, out-doors, with the hands on the hips and taking long, deep inspirations and slow expirations, beginning at the bottom of the chest and filling up, so to speak. This alone, done several times a day, will often materially in-

crease the lung capacity. "Numerous observations," says Lagrange, "prove that it is enough voluntarily to take a certain number of deep breaths every day to produce in a short time an increase in the circumference of the chest which may amount to two or three centimetres." Then there are the various arm movements in connection with deep breathing, such as slowly raising the outstretched arms to a horizontal position and then overhead until the hands meet, slowly and deeply inspiring while raising the arms, then holding the breath a moment, and, finally, lowering the arms and exhaling. Thus the supplementary respiratory muscles of the chest are brought into action. Again, raising the arms to a horizontal position and carrying them back and down, describing a movement of circumduction; standing erect and straightening up, and, finally, rising upon one's toes, deeply inspiring during this movement; lying on the back horizontally upon the floor, or a table, and raising the arms backward and over the head while inspiring. If the table is narrow, the arms can describe a circle about the head.

Still another simple breathing exercise mentioned by Schrötter is the following: The

chest being well thrown forward and the arms placed akimbo, the shoulders are moved backwards in jerks as far as possible, and then a deep inspiration is taken. This can be taken while walking out-of-doors. In the Swedish system of gymnastics, there are almost an innumerable variety of respiratory exercises, most of which, however, are but modifications and combinations of a few simple movements, and many can be performed without apparatus. Again, there are the common gymnastic apparatus for increasing the lung capacity and developing the respiratory muscles, such as the so-called "chest developers" and "lung expanders." The Zander apparatus can also be the ones for the same purpose.

After all, the simple deep-breathing exercises will be the ones most generally applicable, for anyone can do them anywhere. After sitting at the desk for a long time, particularly if bent over, it is a good plan to stand up and spend a few minutes in practicing some of the simple breathing exercises. "What is generally described as overwork," to quote Prof. Schrötter again, "is really the effect of staying too long in a close atmosphere and of an insufficient activity of the respiratory organs."

The Corset

It is hardly necessary to say that in taking breathing exercises one should be so dressed as not to impede the free movement of the chest. The corset has already been referred to. From time immemorial physicians have decried them as interfering with the free movement of the chest in respiration, and impairing the integrity of the respiratory muscles. From time immemorial women have worn them, and will probably always continue to do so, in spite of the evils from them which they too well know. It is fortunate that they are removed at night, and thus for a portion of the twenty-four hours the lungs are allowed free play.

The Habit of Full, Free Respiration

Once having established a proper respiration by the use of some of the simple respiratory exercises, and devoting a few minutes to them every day, the habit of full, deep breathing is formed, and one continues it to a greater or less degree even when in repose. And, further, one is thus fortifying himself against the possibility of disease of the lungs by thus maintaining the pulmonary tissue in

an active, healthy and well-nourished condition, and it is less likely to become a favorable soil for the tubercle bacillus.

Let me repeat and emphasize in closing, that this matter of chest expansion and proper respiration is of vital importance to every one, particularly to those of sedentary habits. By employing this simple precaution, we not only put ourselves in the most favorable condition to avoid pulmonary weakness and disease, but maintain the whole circulation in a healthy condition, which means vigor and well-being to the entire system. A nation of deep breathers can do much toward stamping out and banishing forever the "Great White Plague."

FRESH AIR[1]

The more fresh air we give to our school-children the healthier and brighter will they be, and the faster will they get ahead. This has been proved.

The same is true of workers in shops, offices, and factories. Shall they not be helped to do their best work?

Get more fresh air into your workshops and places of business.

Remember, fresh air is needed in our homes. Night air is just as good as day air.

The air in theaters and restaurants and public halls, crowded as such places are every night, ought also to be kept fresh. Patronize only those that are well ventilated.

Fresh air is entirely free. It is always waiting just outside the window-pane. Don't be stingy with it! Let it in!

Always work, sleep, and play where fresh air is plenty, and keep out-of-doors whenever possible.

When in doubt—open a window.

[1] Prepared by the Boston Association for the Relief and Control of Tuberculosis.

HEALTH RULES[1]

Good Air

Keep away from badly ventilated, badly lighted, dusty, dirty, over-heated, crowded or damp rooms. Keep a window open.

Avoid House Dust

Breathing house dust often causes disease.

Have no tacked-down carpets and mattings.

For floor coverings use rugs or strips of carpets, and clean them frequently outdoors.

Use a broom or mop for floors and keep lower half of window closed while sweeping or dusting.

Open upper half of window if possible. When sweeping rugs or carpets dampen the broom or use wet sawdust or wet pieces of paper, and in winter use dry snow. This will keep the dust from flying about.

Pure Water

Drink pure water from the tap.

Boston water is safe to drink.

[1] Prepared by the Boston Association for the Relief and Control of Tuberculosis.

Water standing in ice-water tanks may become contaminated.

Avoid public drinking cups.

Keep Clean

Take a bath or wash the body with a wet sponge or cloth every day. If you have no bath tub use the public bath.

Do not use towels hung up for common use.

Use pure soap freely.

Wash your hands thoroughly, and clean your finger nails before handling food.

Do not put fingers, money, paper, or pencils in your mouth.

Do not put in your mouth fruit, candy, or chewing gum used by another.

Do not bite your finger-nails.

Clean your teeth every day, using your own tooth brush.

Food

Do not eat food that has been exposed to flies or dust, or touched by unclean hands.

Fruit and vegetables should be rinsed or washed thoroughly before using.

Chew your food well.

Good teeth promote good health.

HEALTH RULES

Sleep

Get enough sleep. Most people need 8 hours a day.

Growing children need 10 hours.

Sleep with windows open and when possible outdoors.

Head Erect

Sit and stand erect.

Practise deep breathing. Breathe through the nose, keeping the mouth closed.

Avoid tight clothing.

Stand on both feet.

Exercise

Take plenty of out-door exercise.

Avoid excess in athletics. Too much exercise may cause heart trouble.

Do not eat or drink when overheated.

Do not exercise soon after eating.

Tobacco and Liquor

Do not use tobacco, liquor or beer. Drinking or smoking is especially injurious to the young.

No athlete in training is allowed to drink or smoke.

Tea drinking is bad for growing children.

Do Not Neglect Colds

Do not neglect coughs or colds. If you do not get well soon, go to a doctor or dispensary for treatment.

Never cough or sneeze into another person's face.

Use a handkerchief or turn your head away.

Do not spit on floors or sidewalks.

Sunshine

Let plenty of sunshine into your rooms.

Joy is a great tonic.

Happiness in work brings success.

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